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Advertisement Index, see page xxiv.

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Vol. LXXIX.] CONTENTS: September 29, 1916. [No. 2,027.

	Page
Engineering during and after the War	337
Rubber	339
The Federation of British Industries	339
Municipal Tramways Association Conference	340
Some Notes on Passenger Transportation in Large Cities (*illus.*)	341
A Proposed British Trade Bank	343
American Electrical Exports	345
New Electrical Devices, Fittings and Plant (*illus.*)	345
Correspondence—	
To Go—Or Not to Go?	346
The Wire-Drawing Industries	346
Legal...	347
War Items	347
Business Notes	349
Notes...	353
City Notes	355
Stocks and Shares	357
Market Quotations	358
Exports and Imports of Electrical Goods during August, 1916	359
The Institution Wiring Rules, by D. S. Munro (*illus.*) (*concl'd.*)	360
The British Association—IV.	361
The Utilisation of Coal as Fuel	361
The Problem of Industrial Unrest	362
Address to the Economic Science and Statistics Section, by Prof. A. W. Kirkaldy, M.A.	362
Radio-Telegraphic Investigations	364
New Patents Applied for, 1916	364
Abstracts of Published Specifications	364
Contractors' Column ... ... Advertisement page	xx

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ENGINEERING DURING AND AFTER THE WAR.

A HIGHLY successful meeting was held at the Mansion House on Wednesday last week under the presidency of the Lord Mayor. It was organised conjointly by the B.E.A.M.A., the British Engineers' Association, and other bodies, and the great engineering and scientific societies, the Ministry of Munitions, the Board of Trade, and other Government Departments, as well as many other interests, were represented either on the platform or in the body of the hall. Many speeches were delivered regarding the indispensable service which engineering had rendered to the Empire during the operations of the last two years. Appreciation was expressed, in the form of a resolution, of the great national service rendered by the munition workers of the country, and the meeting hoped that permanent remunerative employment would be secured for these by the vigorous economic development of the engineering industry after the war. The engineering industry—nobody knows it better than do our readers—has rendered absolutely indispensable service to the Empire, and that fact alone would justify an appeal to the nation on its behalf, but the knowledge that in the future that industry will inevitably possess fundamental importance as the basis of defensive power and of prosperous economic development, strongly supports the claim for special recognition in any reform of a national and imperial commercial policy. By almost unanimous consent to-day such a reform must include patriotic support of British engineering by all public and private users of plant and machinery throughout the Empire. Of this principle the Mansion House meeting enthusiastically approved. One other matter urged by the meeting was the immediate appointment of a Ministry of Industry in order to further the practical application of the proposals of the Paris Economic Conference.

It may be remarked that there is nothing new in such recommendations and appeals. That is perfectly true. The engineering reader needs no educating on these matters at this date, but there are others upon whom it is most necessary that we should make a timely but lasting impression, and a demonstration of this character, in such a place, and with a series of weighty speeches which have been well reported in the newspaper Press, can hardly fail to have that effect. It may seem to be unlikely that the services rendered by engineering will be overlooked when we come to review the various factors which have enabled us to win the war. Our present legislators and Government departments have very good reasons for knowing what that assistance has been in all branches of the Services; millions of workers, too, by reason of their activities, have been brought to know it; and certainly all who

are engaged in the practical operations of the war know that but for the doings of engineering workers at home they would not have been able to achieve their successes on the sea, in the air, and on land. But a vague sort of recognition will not suffice, and what the industry desires is that such recognition shall assume a practical shape in the interests of the nation. In order that all the manufacturing capacity now at our command may be employed after the war, giving a means of prosperous livelihood to returning soldiers and sailors and to present munition workers alike, there must be a safeguarding and encouragement of British industry throughout this country and the whole of the Empire.

The Lord Mayor, in a characteristically appropriate speech, remarked that Germany, which made so many miscalculations, had also overlooked our undeveloped engineering industries. "Before the war engineering was simply one department of commerce—one means for earning wages and dividends. British engineering to-day is recognised to be not merely a trade, an industry, but the main bulwark of European liberty." If our engineering industries were undeveloped to the fullest extent before the war it was largely due to lack of organisation, but to-day they are developed because organised and extended for the purposes of war, and they must never again be permitted to fall into an "undeveloped" condition when the bands of Government control fall away and they are entirely free to handle normal contract work again. If they are the main bulwark of European liberty in these days of war, they will be no less important from the point of view of Empire defence and as a means of employment for the millions of the Empire in the days that follow. We have upon our shoulders a national responsibility for finding employment after the war. To find "work for all" we must find work for all the factories in our midst to-day. In that way we may go far to help to secure the industrial harmony which will be so great a desideratum. The Lord Mayor advocated that steps be taken at once to arrange the general terms of an industrial truce for five years, enabling British engineering to perform a leading part in "the most astonishing era of mechanical progress in the history of the world." Alderman and Sheriff G. A. Touche, M.P., also urged the need for preparing to give employment at good wages to returning soldiers. We must support our home industries instead of buying from present enemies, and if he had his way, we should establish "barbed wire entanglements through which no German dumper could crawl." British bankers must help to extent British trade and help to obtain orders for British goods. In this connection the important report of Lord Faringdon's Committee, published on another page to-day, is of great interest. Mr. C. P. Sparks, one of the later speakers, mentioned that the policy of the Institution of Electrical Engineers was that the first thing necessary was to protect the home trade if we were to secure success in other markets, and if an effective barrier were set up we should have an impetus for securing additional trade affording employment. Sir Oliver Lodge, who spoke a little earlier in the meeting, briefly urged the claims of science, and said that we ought to recognise the union and interaction between science and engineering. We had been too poverty-stricken in our dealings with the development of scientific discovery and invention, and with the trial of new things. Discoveries were waiting to be made, and there were young men ready to work hard at making them, but they must have the means. A little lavishness here and there was really wise. It was in that way that important engineering, chemical, and other organisations had succeeded; also by sending men out all over the world to find the right materials and to solve problems. During the war the Government had discovered the use of scientific advisory committees. Those committees were doing good work, and they should be put on a proper basis and continued. They should consist of young men with eyes for novelty and with plenty of energy, and they would have to be paid—say, playfully remarked Sir Oliver, the salary of a Member of Parliament. Other speakers included the Lord Mayor of Manchester, who, reminding us of Joseph Chamberlain's advice to "Think Imperially," gave a new watchword which might with advantage be posted prominently in Westminster when Parliament resumes—"Think Decimally," also Mr. Wilfrid Stokes, chairman of the British Engineers' Association, and Mr. George Terrell, M.P. (of the B.E.A.M.A.). But to our way of thinking the most timely contribution of all was that of Mr. G. H. Roberts, M.P. (Lord Commissioner of the Treasury), who, as a son of an agricultural labourer, knew from experience something of the causes which lay at the root of industrial unrest. What a lamentable error we shall all fall into if, after the enemy in war is silenced we allow the guns of industrial strife to boom in our midst when all the urgent work of rehabilitation, the clamour of the world for manufactured goods, and the adoption of adjusted trade policy bring an abundance of work to occupy our factories. We must not ignore the warnings; we must calmly note the plain facts of the situation and recognise that they call for the most anxious thought if we are going to guard against serious strife. It is all very well to indulge in pious hopes that public feeling would not permit general strife to occur, but to act thus will be but to let things drift into danger. The situation must, as far as possible, be prepared for in advance, so as to avoid a colossal calamity.

Spokesmen representing both Capital and Labour have been making suggestions for an understanding; what is urgently needed is that these suggestions should develop immediately into *pourparlers*, a powerful and representative conference, and a definite agreement or compact be entered into as far as is practicable in the absence of many men with the Forces. Mr. Roberts, probably bearing in mind the appeal of the Lord Mayor for a five years' industrial truce, devoted his speech entirely to the question, and he was listened to with a seriousness and sympathy which augured favourably. He believed that unless we could establish a reasonable period of industrial harmony the British Empire would rest upon very shaky foundations. Politically they had recognised a truce—minor differences which set man against man before the war were abandoned as comparatively trifling when the interests of the country were at stake. The national unity must be preserved after the war, or the coming years would be years of decline. The war had to be paid for, and neutral nations, profiting at our expense, would be better equipped to pursue competition, while we should be in a less favourable position, with the exception that the war had awakened us in a way that nothing else could have done. It had shown us what could be done by means of co-operative action. As one who had advocated the just claims of Labour for a generation, he frankly and sincerely asked engineering employers to remember that if Labour had had its failings, they could not ignore their own failings when they asked the working classes of the country to assist them by co-operating. A friendly understanding should be encouraged—the atmosphere was now favourable owing to our common losses—they must not wait, "Do it now!" It was for the employers to make the approach, and such as himself would be willing to help. They must remember that the working classes did not voice grievances in mere wantonness—they had such grievances. Human society must be based on better and more elevated principles. There would never be another opportunity like the present for facing the matter. He was prepared to say to his class when they were

properly treated, "You are expected to give your best without regard to restrictive conditions." Mr. Roberts fully realised the importance of increased output, and he knew that the workers could give it, but the problem of securing increased production was not so simple as some people might express it. They had to face the apprehension of the workers that increased output would lead to glut and unemployment. Personally, he believed that increased output would increase the selling power of the nation. We should all work to prevent as far as we could the cyclical fluctuations in trade, and so make employment fairly regular throughout the year for the whole of the working classes. In order to do that, one thing that was essential on both sides was goodwill. There are many other essentials, too—but that by the way. He knew that the workers would demand a restitution of the relaxations that they had agreed to during the war, in the interests of the State, but that need not prevent engineering employers from entering into negotiations now.

If the Mansion House engineering meeting had yielded nothing more than this voice of warning and appeal from a leader of Labour to leaders of industry it would have been well worth while. We believe that the great majority of the workers, as well as the employers, are heartily sick of industrial strife. If the workers can be induced to understand the position as Mr. Roberts knows it, and give an increased output which will strengthen our manufacturing and trading position, and if employers can be induced to sympathetically enter into the natural desires of the workers for better conditions, and to fulfil their responsibilities towards them as well as to their shareholders, the greater part of what is necessary in order to secure a long period of industrial prosperity will have been done. We have to remember that Labour has no love for a body of shareholders. To him it is a soulless, heartless company, devoid of human feelings, with an insatiable thirst for dividends, until perhaps he becomes a shareholder himself sharing in the profits, and, maybe, somehow in the losses. Here we introduce the touch of nature which may make them kin, though we recognise that co-operative working has often failed because the profit divided among the workers has amounted to less than a trifling advance in wages, and the working of the principle has been defeated. The problem seems to resolve itself into the need for finding a basis upon which the fair and just proportions of wages for Labour and profit for Capital respectively should be calculated. It may be that there will be many thorny questions raised by such an inquiry, inasmuch as both Capital and Labour must be sustained in decency if we are to have satisfactory and prosperous industry, with its just wage-earning and its fair dividends. But notwithstanding all the difficulties, we agree with Mr. Roberts that these need not stand in the way of immediate negotiations, and we trust that his invitation to the employers to approach Labour on the matter will be taken advantage of without delay.

Rubber.

EVENTS in rubber circles have been more interesting, and the hints thrown out in various quarters as to the market being imparted a sharp fillip have certainly received some confirmation, but this has been brought about by special circumstances, or in connection with the filling of special requirements on behalf of Russia, to which country considerable quantities are now being shipped which are destined to reach the port of Archangel prior to the close of navigation. For some time past some difficulty has usually been experienced in obtaining permits for export, but on this occasion the authorities appear to have afforded every facility, and there is no doubt that considerable quantities of the product have been taken care of, so that the position of spot rubber has temporarily improved. Interested support, possibly to some extent in connection with share operations, tended to assist the market upward, but there has been really no change in fundamental conditions, and since the urgent demand has been fairly well satisfied the market must be expected to fluctuate, although it is generally surmised that the price of fine plantation rubber will not break below 2s. per lb., which remains to be seen. Prices now stand at about the same level as they did this time last year, when the warehouse stocks were comparatively small, and big tonnages were being diverted to American ports, but indications this year are highly obscure. For one thing the industrial outlook is not so good as it was then, so that it is rather doubtful whether the upward movement which took place over the last three months of the past year will this year repeat itself.

After meeting Russia's needs the general trade demand is again subdued, and manufacturers seem in no hurry to anticipate their requirements. There is some fear at any rate that spot supplies will once again accumulate, for the shipments from the East continue on a liberal scale in consequence of the heavy production as testified by the excellent returns of output disclosed by the estates for the past month. Some months ago there were no signs of excessive supplies, but the rate at which the shipments have been going on, and the takings by consumers have shrunk, there is now no mistaking the fact that there is a palpable surplus which can hardly be worked off except by keeping prices at an attractive level. The home stocks are something over 9,000 tons, and cannot be expected to be much reduced unless consumers are willing to carry larger reserves. An unhealthy feature is that the Eastern estates, for some reason or other, are still reluctant to negotiate new orders for forward delivery except at their own prices, showing a premium over the value of spot delivery. This arbitrary policy seems rather inconsistent with the existence of unwieldly supplies on the spot. Were there any inducement afforded to consumers to operate ahead, the market would doubtless be imparted a little more activity, but as it is, considerable quantities of plantation rubber continue to be landed on this side unsold, which naturally bars the way to a revival of confidence. The comparatively high price of fine hard Para is misleading, chiefly owing to the limited tonnage of this product available.

The Federation of British Industries.

ACCORDING to the daily Press, a circular has been issued by Mr. F. Dudley Docker, president of this Federation, from the offices, 51, Lincoln's Inn Fields, W.C., inviting firms to apply at once for membership. The organisation, as our readers know, has been formed for the purpose of providing a body capable of representing the interests of British manufacturing and producing industries, and it is for every reason important that it should be made as strong and completely representative as possible. The list of members of the Executive Council includes the following:—Sir Vincent Caillard (Vickers, Ltd.), Mr. F. R. Davenport (Willans & Robinson, Ltd.), Sir R. A. Hadfield (Hadfields, Ltd.), Mr. Henry Howard (Stewarts and Lloyds), Mr. Godfrey Isaacs (Marconi Co.), Mr. E. Manville (Daimler Co.), Mr. F. J. Nettlefold, Mr. Wilfrid Stokes (Ransomes & Rapier), and Mr. A. W. Tait (British Aluminium Co., Ltd.). Full particulars of the objects of the Federation can be obtained from the Secretary, Mr. R. T. Nugent, at the above address. The subscription is £100 per annum until June, 1919.

MUNICIPAL TRAMWAYS ASSOCIATION CONFERENCE.

On Thursday morning, last week, the fifteenth annual meeting of the above Association was opened at the Surveyors' Institution, Great George Street, S.W., and although no comparison can be made with pre-war gatherings, yet there was quite a satisfactory muster of members.

Mr. Peter Fisher, of Dundee, this year's President, after welcoming those present, announced with regret that Mr. A. L. C. Fell (L.C.C. tramways), who had been ill for some time, had had a relapse (which we understand will necessitate his taking a six months' voyage), and a resolution expressing sympathy with Mrs. Fell was passed by the meeting.

Mr. Fisher's Presidential address followed; we append an abstract of his remarks.

Mr. McElroy's paper on the subject of passenger transportation in large cities (which we also reproduce in abstract), and a short discussion, occupied the remainder of the morning.

The paper is an interesting contribution to a subject which will, no doubt, sooner or later require the careful consideration of the authorities of our largest cities, and that it did not attract more speakers in the discussion is probably evidence that the "saturation point" in surface passenger transport has reached an appreciable stage in only one or two instances in this country.

Mr. McElroy's suggestion to provide "parallel routes by forming new streets and widening others at considerable cost," is probably not intended to be of general application; its possibility or otherwise seems to depend very much on the map. In any case the expensive duplication of routes to take care of "rush" traffic may be a costly expedient if we have ultimately to fall back on the electric railway—the ideal, though most expensive, method of dealing with traffic peak loads electrically.

A new tramway route in a populous city has a habit of building up its own traffic, and it seems possible that the new route might in a brief space of time be no better off than the original one.

A rough estimate of the financial features of such a parallel-route scheme would be a valuable addition to the paper, as also would an alternative estimate of the cost of relieving existing routes during rush hours by means of electric or other 'buses, running in adjacent thoroughfares.

American authorities have not, so far as we are aware, given much time to the study of the motor-'bus in relation to surface traffic problems, and in this country the 'bus authorities have left the rush-hour traffic problem severely alone, so that we have no practical data as to the capabilities of the 'bus in this respect. We agree, however, with our indefatigable friend, Ald. Fred. Smith, of Liverpool, that the paper ought to have appealed to a wider circle than it apparently did.

In the afternoon the paper by Messrs. Holford (Salford) and Clough (Bury), on the "Utilisation of Tramways for Goods Traffic," was read and discussed.

The subject has always been an attractive one in South Lancashire, where the map is studded with manufacturing towns, little and big, interlinked by tramways of a uniform gauge, and there are other areas where similar conditions exist to a considerable extent.

The authors give a brief history of the subject, but we notice that they do not refer to the earlier proposals of Mr. A. H. Gibbings, at a time when the indispensable links between the inland towns and Liverpool were being constructed by the South Lancashire Tramways Co. Mr. Gibbings read a paper on "The Carriage of Goods on Electric Tramways" before the Manchester section of the I.E.E., in the early part of 1903, in which he discussed the problem as regards South Lancashire.

In the discussion, Mr. Mozley (of Burnley) contested the view that tramways have no powers to construct lines into yards of mills, warehouses, &c., and pointed out that the general adoption of the system of railless battery-trolley wagons, of the Bradford type, would involve obtaining fresh powers from Parliament; Mr. McElroy rather doubted the wisdom of tackling the general question of goods carriage in view of the progress made with steam or other vehicles.

The meeting adjourned at 3.30 p.m., when special 'buses were in attendance to convey the members to the Milman Street Training Depôt of the London General Omnibus Co., where, under the guidance of Mr. Blain, the features of that establishment were demonstrated, in much the same way as on the occasion of the visit of the Tramways and Light Railways Association, which was described in our issue of July 7th last.

On Friday morning the annual business meeting was held Mr. Mozley (of Burnley) being elected President for the coming year and Ald. J. Miles, J.P. (of Bolton), Vice-President.

The membership includes 112 managers and assistants, 76 local authorities, and one honorary member. The total income of the Association for the year was £373, the year's surplus being £32, and the balance in hand (excluding the reserve fund) £228.

The recommendation of the Sub-Committee of the Advisory Committee of the Board of Trade that, after the war, all Government departments, local authorities, and statutory bodies entrusted with the control of moneys raised by taxes or rates should be under legal obligation to purchase, so far as possible, only goods produced within the Empire, was discussed; the Executive Council agreed with the principle enunciated in a resolution submitted by the Council of the Incorporated Municipal Electrical Association, viewing with deep concern the recommendation.

An amendment to delete the paragraph from the report was lost, and the report was adopted.

On Friday afternoon, through the courtesy of the L.C.C., a trailer-car was available for inspection on the Embankment; the Council possesses 158 of these cars, practically all of which have been constructed from the chief officer's design.

These cars weigh unloaded 6 tons 5 cwt. each, and will accommodate 30 inside and 18 outside passengers, the seating being of the cross type.

The weight of the car is carried by rubber-padded coil springs on swinging links connected to long laminated springs which rest on a seating on the top of the axle-boxes.

The underlying principle of the automatic brake gear, which is spring controlled, consists in maintaining a constant relationship between the pull on the draw bar and the pressure on the shoes.

By the adoption of radial ball bearings in the axle-boxes, the tractive effort at the draw bar, on the level, has been reduced from 38 to 17 lb. per ton of load.

A very simple type of automatic coupling is employed.

The visitors were subsequently conveyed in special cars to the Council's Central Repair Depôt and generating station at Greenwich, while another party visited Bexley to inspect the Woods-Gilbert rail planer in use on the local tramways.

Practically the whole of the repair work on the L.C.C. cars is carried out at the repair depôt, which is, we believe, the most extensive one of the kind in the country.

As many of our readers are aware, the Greenwich tramway power station is gradually being re-equipped with turbine plant, and at present there are installed four 5,000-kw. and two 8,000-kw. turbine sets, while two of the original vertical-horizontal Corliss reciprocating sets are still available for duty, though these will in the near future be superseded by turbine plant.

Part of the boiler installation, utilising the two chimneys whose aspirations were cut short at the instance of the Observatory authorities, is now operated in conjunction with a mechanical-draught installation, resulting in a considerably increased evaporation from a section of the plant.

The following is an abstract of the Presidential address:—

The annual report of the Executive Council shows that a large proportion of the work of that body during the past year has been in relation to problems arising out of the war, *i.e.*, supply of tramway tickets, tramway tire supplies, retention of tramway employés, Munitions of War (Amendment) Act, 1916, classification of tramway material, women as tram-car conductors, Lights (Vehicles) Order, 1915, British trade after the war, and disabled soldiers and sailors.

In connection with the Munitions of War (Amendment) Act, 1916, your Council were successful in getting the term "munitions work" extended to cover "tramway facilities." No fewer than 44 municipal tramway undertakings are up to this date certified under the Act, and many others are authorised to issue Class "B" Priority Certificates to facilitate the delivery of supplies for maintenance.

It is not always realised by the average man that tramways are to-day playing a very important part in the national crisis in carrying workpeople from their homes to the factories and *vice versa*. It is therefore very gratifying that the Government have realised the great importance of tramway undertakings and have given them such facilities as enables them to keep going.

The past year has not been fruitful in developments and extensions so far as tramways and other passenger-carrying facilities are concerned. The most outstanding features of the year are the readjustment of tramway fares and stages, the employment of females on a large scale, and the introduction of volunteer labour for driving, the latter innovation having been introduced in Birmingham, Newcastle, and Bradford, where 320 auxiliaries are employed with quite satisfactory results.

In several cases changes have been made whereby the average fare per passenger has been materially increased, and in all these cases additional revenue has been the result. Strange as it may seem, some authorities have actually been considering the decreasing of fares and the cheapening of tramway facilities.

Present conditions provide ample justification for suggesting that the existing low fares should be adjusted so that the increased costs can be fully met. While the accounts of most municipal tramway undertakings look fairly satisfactory, still it must be admitted that much necessary expenditure is only suspended till the end of the war.

There are now 8,609 females employed on tramways as follows:—8,433 as conductors and 176 as drivers.

Some idea as to the part tramways are taking in the great conflict may be obtained from the following figures:—

Number of municipal tramway employés who have joined His Majesty's Forces	20,905
Percentage of total number of employés	38
Number of men who have left municipal tramway undertakings to join munition factories ...	1,893
Percentage of total number of employés	3¼
Amount paid to dependents of employés serving with His Majesty's Forces	£854,649
Average allowance per man per week	10s. 7½d.
Amount collected on cars for various national and other objects	£43,800
Amount contributed by municipal tramway employés to various relief funds	£36,070

What of the future? Changes will come. The war certainly will not only be an interruption of what formerly existed. What will be the precise nature of the problems which, when they emerge, must be boldly faced, no one can forecast. It is a matter still in the region of conjecture.

The history of municipal tramways is a history of progress and improvement. Sometimes we were tempted to think that everything had been done which could be done, and yet in tramway enterprise, as in all other departments of human affairs, there is no such thing as finality.

Simultaneously with the cessation of hostilities various problems relating to our employés will present themselves. For example, the question of war wages and bonuses, and the position to be taken up regarding our men who may be in receipt of pensions but still able to perform certain duties.

The development of tramways from a passenger-carrying point of view has occupied our attention almost entirely in the past. Now the other point of view, viz., transit, such as tramways can offer for goods, should have our fullest consideration.

In the days to come, when economic competition between nations will in all probability be even fiercer than in the past, transit will undoubtedly play an important part. Relaxation of restrictions and regulations may be necessary, but when national interests are involved there should be no difficulty in this respect.

Railways are crowded with traffic of all kinds, and considerable complaint is heard all over the country regarding the delays that are taking place. It is therefore just a little surprising that the Government have not seriously considered the usefulness of the various tramway undertakings for the carriage of munitions and general merchandise.

Some Notes on Passenger Transportation in Large Cities.

Abstract of paper by MR. J. M. MCELROY (Manchester).

SYSTEMATIC studies of the passenger transportation requirements of the large cities in this country have not in the past been undertaken with that thoroughness which has been characteristic of many cities abroad, particularly in America.

Town-planning schemes and the making of provision for future transportation requirements are really part and parcel of the same problem, and should be considered together.

As cities grow, due to the gradual increase in population, and as the riding habits of the people develop, it becomes more and more difficult to make the channels of passenger transport equal to the ever-growing demands.

There is a constant migration of the population from the inner to the outer zones, and this is greatly accelerated by every extension and improvement in the means of transit. Suburban districts rapidly become urban, and new suburban districts in the outlying areas are always in process of formation. Smaller towns and districts on the outskirts are drawn into closer touch with the cities, and a greater community of interests is being established over a gradually widening area.

Every extension of the means of transit into the outer zones adds to the difficulties of handling the traffic in the central zone, and in time the congestion becomes so acutre that the city authorities realise that they are face to face with the inevitable traffic problem.

Some years ago a student of traffic questions, having

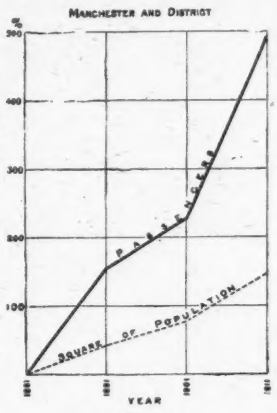

FIG. 1.

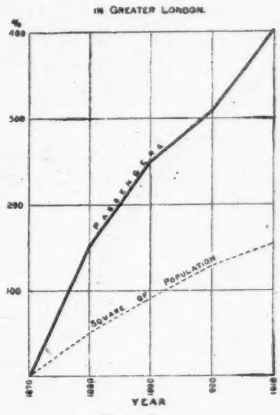

FIG. 2.

analysed the statistics of a number of European cities, found that on the average the number of passengers carried increases in the same ratio as the square of the population.

This rule is approximately true as regards American cities, but it does not appear to be true as regards British cities.

The curves in fig. 1 show the percentage increase of the passengers carried, and the square of the population in Manchester and the surrounding districts during the past three decades; fig. 2 shows similar information as regards Greater London; figs. 3 and 4 show the facts as regards Greater New York and Boston.

Many factors tend to accelerate the normal growth in a particular city. Quite apart from the question of the increased facilities and the introduction of general improvements in the means of transit—which are always followed by

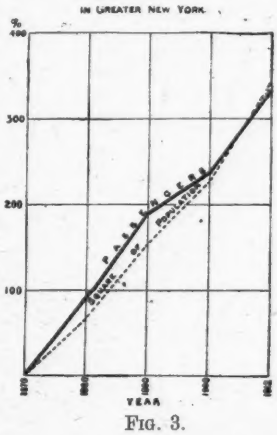

FIG. 3.

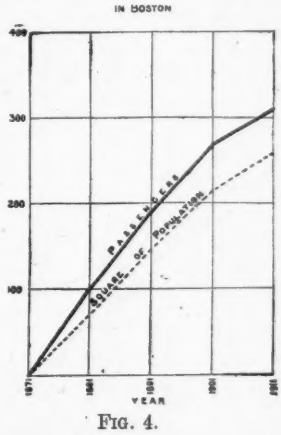

FIG. 4.

a rapid rise in the number of passengers carried—the factor as to the fares charged, and the changes made therein from time to time, has a most important bearing on the subject. Comparative statements as to the number of passengers carried tend to be misleading because they do not indicate the average distance travelled by each passenger.

The ultimate volume of passenger traffic which can be dealt with by facilities which use the street surface is limited by the capacity of the arterial routes near the central parts of the city. When the traffic on these routes approaches the saturation point then additional arteries must be opened out or other transit facilities provided

The new facilities which may be provided are (1) Railways —(*a*) in shallow subways, (*b*) in deep level "tubes," (*c*) on elevated structures; (2) shallow subways in the congested areas into which the surface cars can be run.

Many cities have not waited until the saturation point of the surface facilities has been reached before underground or overhead railways have been constructed; time saving has been the main factor which has led to the construction of many city railways.

Experience shows that the provision of shallow subways for surface cars cannot be justified owing to the great cost of construction and the comparatively small amount of traffic which can be passed through them.

Underground lines of any description can only be justified by a dense traffic demanding the operation of high-speed trains run at very close intervals, and such lines should be so laid out that they can be worked in conjunction with the surface lines, which should gather the local traffic and feed the underground lines.

It is not at all likely, having regard to the general experience, that private enterprise will be willing in future to shoulder the great outlay involved in the provision of underground facilities.

The average cost per route mile of existing underground and elevated railways in Greater New York is £564,313, in Chicago £372,563, in Philadelphia £485,167, in Boston £684,063, and in London (taking the Central London, City and South London, Great Northern and City, and London Electric Lines) £664,230.

In New York the total outlay on the underground and elevated lines—when the extensions are fully completed—will be £137,000,000. The expenditure on the extensions, undertaken in recent years, will be £68,000,000. This capital is being provided roughly half and half by the city and by the operating companies. The companies are to get out of the revenue all their operating expenses and 6 per cent. upon their investments, and out of the balance the city is to get the interest on its investment plus 1 per cent. for sinking fund, and if there is any profit after these payments have been made it is to be divided equally between the city and the companies. But the city authorities are not looking for profits. They are determined to provide adequate travelling facilities—and so important a duty on the part of the municipality do they consider this that they have made up their minds to do it properly, even if it entails a charge upon the rates of the city.

In London—where all the capital for the underground railways has been found by private enterprise—the amount available for dividends on the ordinary capital was only sufficient to pay just over 2 per cent.

In studying the problem which we are now faced with in Manchester—where several of our arterial routes approaching the centre of the city have practically reached the saturation point—I came to the conclusion that the proper course was to improve and make more efficient the existing surface lines by opening out parallel routes, by forming new streets and widening others at considerable cost, and also by adopting tramway terminals near the heart of the city, the latter being necessary on account of the narrowness and bad lay-out of the central streets.

The necessity of utilising the streets to the fullest advantage involves the question as to the most suitable means of surface transit, having regard to the traffic requirements.

An abstract discussion as to the relative merits of tramcars and motor 'buses, without references to the particular purpose for which they are intended to be used, is likely to be very misleading. Each type of vehicle has its peculiar advantages, and will be utilised for handling that class of traffic for which it is best suited. The tramcar, on account of its greater seating capacity and its ability to cope with traffic of a widely fluctuating character, will be utilised where heavy peak loads have to be catered for. On the other hand, where the volume of traffic is not great, or where there is a steady traffic flow throughout the day, motor 'buses will probably prove to be the more suitable vehicles. In some instances it may be found to be advantageous to run the two types of vehicle along the same routes.

The aim should be to use the highways as channels for passenger transport to the best possible advantage, and the most efficient means of doing this can only be decided upon in any particular case by a study of the traffic characteristics.

Attempts have been made to show the relative efficiency of the two types of vehicles—tramcars and motor 'buses—by comparing the *average* load. It has been pointed out that "the average load of a tramcar with 74 seats is 10½ passengers and of the motor 'bus with 34 seats is eight passengers, and, therefore, the relative efficiency of the motor 'bus is almost twice as great as that of the tramcar."

The relative efficiency of the two types of vehicle cannot otherwise be gauged than by their ability to cope with the volume and flow of traffic in particular cases.

Fig. 8 shows the loading of a typical tramcar during a full day's continuous running on the Palatine Road route, Manchester. The car has a seating capacity for 75 passengers. The diagram also shows the seating capacity of a motor 'bus. The tramcars have the whole of the seating accommodation available in all conditions of weather; in bad weather the outer seats of motor 'buses are nearly always empty.

The *average* number of passengers carried per car mile on the tramcar shown on the diagram was 14. The fallacy of using this figure as a measure of the car's efficiency is too obvious to need comment.

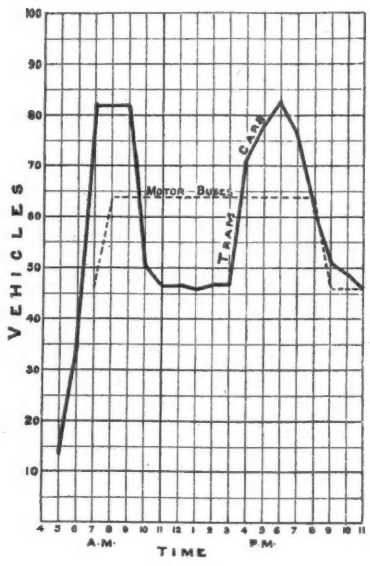

Fig. 5.

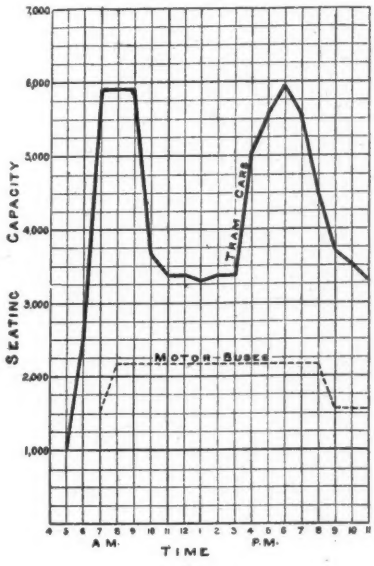

Fig. 6.

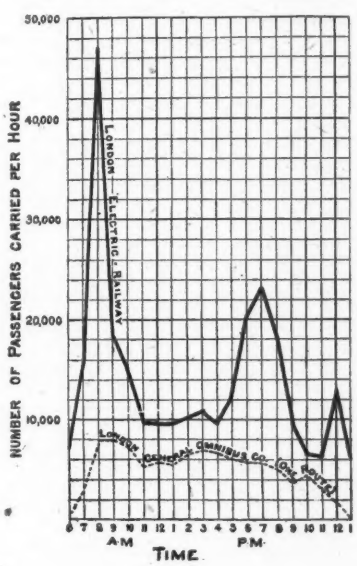

Fig. 7.

Figs. 5 and 6 (kindly prepared for me by Mr. A. L. C. Fell) show what the tramcars and motor 'buses are doing respectively to meet the traffic demands on a typical route in London. Fig. 5 shows that the motor 'buses make no attempt to deal with the peak between 7 and 8 a.m., but obviously cater for a steady all-day traffic.

Fig. 6 shows the relative seating capacity of the tramcars and motor 'buses referred to in fig. 5.

Fig. 7 shows the fluctuating character of the loading on the London Electric Railways and on one route of the London General Omnibus Co. Here is an illustration of the ability of the railways to handle heavy peak loads and the lack of capacity in the case of the motor 'buses.

The making of proper provision for handling the rush-hour traffic will always be the difficult part of the passenger transportation problem. It involves, and will continue increasingly to involve, a large expenditure of capital and comparatively high operating costs.

It is on account of this that competition by separate companies for the steady all-day traffic by means of vehicles which can be run on the public streets at a relatively small capital cost, and which escape many of the obligations placed upon those who cater for the peak loads, is unfair and should not be permitted.

The right to operate public service vehicles, acquired by merely obtaining an annual licence, is archaic, and new legislation dealing with this matter is urgently needed. Concessions to use the public streets, if granted, should carry with them obligations in the public interest, with corresponding security and protection for the operators.

It is becoming more and more clearly recognised, by all

those who are qualified to judge, that the public interests are best served by making the facilities for city passenger transportation a monopoly—a monopoly subject to the control of the city authorities, who should possess full powers either to provide and operate the facilities themselves, or, if they think fit, to grant franchises to private companies to do so, subject to control and regulation in the public interest.

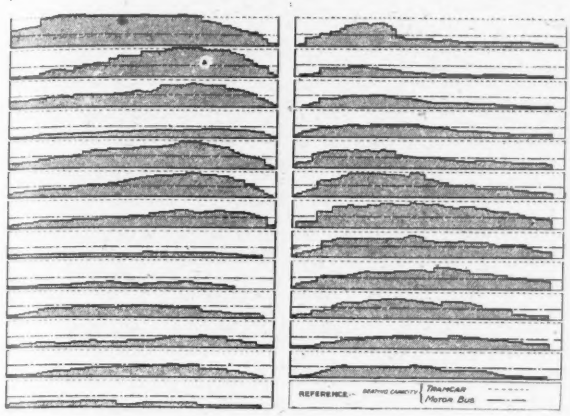

FIG. 8.

The world's experience has shown that every city should have a permanent authority directing the initiation and carrying out of all schemes for new transit facilities, in order that there may be continuity of policy, and that the future needs of the city and the surrounding districts over a wide area may be properly looked after.

DISCUSSION.

Coun. H. GORDON (L.C.C.), in opening the discussion, said some years ago he found, when on the Continent, that the travelling habit was much more extensively developed in continental cities than in London, and that tramway construction was more extensive per head of population. He thought it was a fallacy to suppose that there was any real connection between journeys per head and population of cities. He had studied the problem of relieving traffic congestion in the centre of our cities, and arrived at the conclusion that none of the proposed means would be effective. Experience in Paris and London showed that crowded thoroughfares became no less crowded by the provision of underground electric railways. He did not think they should be troubled about that, as it was an indication of prosperity; he thought, however, that a great deal could be done by the proper regulation of traffic. They ought to use the most suitable vehicle for transport, and it was known that the tramway car, relative to its carrying capacity occupied the lesser space. The flexibility of the 'bus was a myth when it was considered how that flexibility interfered with the regular flow of traffic. The tramway could not efficiently carry the railway peak load, and, on the other hand, the motor 'bus was excellent for isolated journeys. The unified control of London underground railways and 'buses should be extended to the tramways as well, and all should be controlled by a public authority.

Coun. BARROW (Birmingham) said he wished to emphasise the importance of the tramways working in with the "town planning" department. Several schemes of town planning were in being at Birmingham, and roads of 100 or 120 ft. wide were provided for. The traffic problem of the centre of Birmingham had always been a difficulty, and a special committee had been appointed to deal with it.

Ald. F. SMITH (Liverpool) said it had been perfectly clear to them some years ago that they could improve on German methods in Liverpool. They were faced with traffic developments in Liverpool in the future, but he doubted whether the result of working hand in hand with the town planning people would not result in the transfer of tramway profits for road construction, &c.

Mr. J. B. HAMILTON (Leeds) said he had brought the subject of passenger transportation in cities before them two years ago, and he had no doubt there must be a central authority to exercise control. He agreed that they appeared to be approaching a condition of saturation in large cities, but it was perhaps unfair to accuse them of lack of foresight in view of the phenomenal increase in traffic in recent years. Now that they realised the position there should be co-ordination amongst the authorities and public control by the municipality of all passenger transport facilities.

Mr. MCELROY, in replying to the discussion, said that sooner or later the arterial roads would approach saturation point, and then the problems he had mentioned would have to be faced. He urged them to make financial provision in all large cities in connection with their tramways to meet the possible developments of the future.

A PROPOSED BRITISH TRADE BANK.

THE Committee which was appointed by the Board of Trade some months ago to investigate the question of financial facilities for assisting British trade after the war, has acted with businesslike promptitude in reporting its conclusions and making its recommendations. That this Committee has found it possible to complete its work earlier than have those which are concerned with particular industries is probably due to the fact that after the discussion that the matter received in the years preceding the war there was little difficulty in estimating the needs of the case and in focusing the views of the majority of responsible opinion. But probably also it has been considered that the findings in regard to this matter should in any case be decided before other committees published their conclusions, inasmuch as future policy in regard to financial facilities may have a more or less important effect on all of those industries. It will be remembered that Mr. Runciman, in the House of Commons, referred to the possibility of "additional institutions" having to be set up if the existing banking institutions, of which we were nationally so proud, found it impracticable to handle more extensively what we have for years come to know as industrial banking business. It was therefore as well that so many banking authorities and financiers were members of the Committee. The recommendations that they make are so framed as to aim at the better support of British enterprise in after-the-war competition with the enemy. It is proposed that a British Trade Bank, under Royal Charter, be formed without delay, so that the preliminaries may be completed before the war is over, and that its operations be especially conducted with a view to assisting our overseas trade. It is considered that it will not unduly interfere with existing banks, banking houses, or financial institutions, but will fill a gap between the home banks and the colonial and British-foreign banks and banking houses, and will develop facilities not provided by the present systems. Its chief features would be as follows:—

1. It should have a capital of £10,000,000. The first issue should be from £2,500,000 to £5,000,000 upon which in the first instance only a small amount should be paid up, but which should all be called up within a reasonable time. A further issue should be made afterwards, if possible, at a premium.
2. It should not accept deposits at call or short notice.
3. It should only open current accounts for parties who are proposing to make use of the overseas facilities which it would afford.
4. It should have a foreign exchange department, where special facilities might be afforded for dealing with bills in foreign currency.
5. It should open a credit department for the issue of credits to parties at home and abroad.
6. It should enter into banking agency arrangements with existing Colonial or British-foreign banks wherever they could be concluded upon reasonable terms, and where such arrangements were made it should undertake not to set up for a specified period its own branches or agencies. It should have power to set up branches or agencies where no British foreign bank of importance exists.
7. It should inaugurate an information bureau in close touch with the Commercial Intelligence Department of the Board of Trade.
8. It should endeavour not to interfere in any business for which existing banks and banking houses now provide facilities, and it should try to promote working transactions on joint account with other banks, and should invite other banks to submit to it new transactions which, owing to length of time, magnitude, or other reasons, they are not prepared to undertake alone.
9. Where desirable, it should co-operate with the merchant and manufacturer, and possibly accept risks upon joint account.
10. It should become a centre for syndicate operations, availing itself of the special knowledge which it will possess through its information bureau.
11. It should receive Government assistance, being appointed to carry through foreign commercial and financial transactions in which the Government may be interested.

The Committee considers it desirable that the British Trade Bank should receive as much official

recognition as possible without coming under Government control:

"Our Foreign Office should, for instance, be asked to instruct British Embassies and Legations abroad to put the institution's representatives in contact with all commercial attachés, consuls, &c., with clear instructions to them that the institution is a commercial concern enjoying the full confidence and approval of the Government; and similar instructions should be given by the Board of Trade to their Trade Commissioners in the Dominions."

The Committee did not consider it necessary to take much evidence, as that which had been put before other Committees, which have not yet reported on their trades, on the same subject, was put at its disposal. The report contains the following statements:—

It is desirable that we should state clearly our definitions of banking facilities in the British sense, and of what we would call by the wider name of financial facilities. The former are properly limited to those which can be provided without a "lock-up" such as would impair the liquidity of funds and deposits at call and short notice. For this reason the usual practice of bankers here is to confine their advances as a rule to a currency not exceeding a few months. By financial facilities we mean, generally speaking, those which would involve a longer currency than this.

A careful study of the evidence above referred to, and our own knowledge of banking arrangements and facilities, lead us to the conclusion that there exists to a considerable extent at the present time in this country the machinery and facilities for the finance alike of home trade and of large overseas contracts, and for carrying through much of the business which has been done by foreign banks. The British banks afford, we believe, liberal accommodation to the home producer. British bankers are not shy in making advances on the strength of their customers' known ability and integrity, and the charges for accommodation are, we believe, often lower than the corresponding charges in foreign countries. Similarly, the colonial banks and British-foreign banks and banking houses render immense assistance to British trade abroad, and certainly in the Far East, and in many parts of South America British banking facilities do not fall short of those of any other nation. We find also that in the case of large contract operations British contractors, with the assistance of financial houses, have in the past been ready to provide large amounts of capital and to take considerable risks in connection with the operations which they have undertaken.

Our arrangements, however, are faulty in our not co-ordinating many of the facilities mentioned in the previous paragraph. We recognise also that the British manufacturer may be frequently in want of finance of a kind which a British joint stock bank with liabilities as above described could not prudently provide, whereas the German banks in particular seem to have been able to afford special assistance at the inception of undertakings of the most varied description, and to have laid themselves out for stimulating their promotion and for carrying them through to a successful completion.

We conclude, therefore, that there is ample room for an institution which, while not interfering unduly with the ordinary business done by the British joint stock banks, by Colonial banks, and by British-foreign banks and banking houses, would be able to assist British interests in a manner that is not possible under existing conditions.

Such an institution might in many ways be beneficial to the development of British industry and manufactures. It might, in certain cases, after careful examination, agree to make advances for the extension of existing manufacturing plant, or perhaps for the amalgamation or co-ordination of certain works, so as to reduce the cost of production. It would assist these works to obtain orders abroad, and give them reasonable financial facilities for executing these orders. It should give a preference in matters of finance to orders which are to be executed in this country.

Such an Institution could also take a leading part in the inception of transactions and assist in connection with the machinery of overseas business. In the case of German manufacturers it frequently happens that on the board of the manufacturing company there is a representative of a bank, and there seems little doubt from an examination of the information which is available that the German banks have exercised an amount of control over the manufacturing concerns in which they are interested, which would not be possible, even if it were desirable, in the United Kingdom. A large number of our manufacturing undertakings are wealthy concerns, and would not tolerate for one moment interference by bankers in their affairs, and, indeed, would probably resent any inquiry into the nature of their business arrangements. Such manufacturing concerns, however, do require assistance when they transact overseas business. Take as a single instance the case of a Midland manufacturer selling goods to Italy. The Italian buyer has been accustomed to long credit, and if long credit is refused the business will probably be impossible. The manufacturer sells goods for, say, £50,000, and the payment of that price would leave him with a considerable margin of profit, but the offer of the Italian buyer to pay him the equivalent of £50,000 in lire at six or twelve months is not attractive. He would much rather accept a lower figure than £50,000 for a clean cash transaction in sterling, and it is in connection with such business as this that an institution of the kind contemplated would be liable to act as intermediary (taking part of the whole of the financial liability) with profit to itself and satisfaction to the manufacturer.

Or to take another case, that of a contractor who has entered into a contract with a foreign Government, payment being made as works proceeded, such payment being possibly in paper in a foreign currency, the contractor in that circumstance would willingly share his profit with an institution which would be responsible for the finance of the securities receivable by him.

It would be essential in conducting business with manufacturers and merchants, that the Institution should draw and accept bills, and it should generally be in a position to undertake credit operations. It might be well to provide that a certain portion of uncalled capital, or a portion of paid up capital (if it is deemed wise to have all called up) should be reserved against this class of risk.

If an Institution is formed to carry out transactions of the kinds indicated above, it follows that it must be equipped with knowledge of affairs in the countries with which it may do business, and its managers must, by personal visits, acquaint themselves with the conditions of business in all important foreign centres. It must have either branches or agencies in those countries, and in this connection the exceptional position held by British-foreign and Colonial banks should be fully availed of. Instead of having to organise, as was the case with German banks, new subsidiary undertakings, the Institution would largely use, under agreement, the existing banks and the facilities which they can afford.

The Institution must be equipped with an up-to-date information department, and this will of necessity play a large part in its usefulness and financial success. This might properly be called a Bureau d'Etudes, independent of the Commercial Intelligence Branch of the Board of Trade, but in close touch therewith and under agreement entitled to all possible facilities. That such a bureau is essential has been made abundantly clear by the evidence given by witnesses we have heard, and also by the evidence given before other committees. It would not necessarily deal only with schemes in which the Institution proposed to take financial interests, but might be made a centre for investigation of projects on behalf of others, and a considerable revenue might be obtained thereby. Chambers of commerce and joint stock banks which were disposed to help valuable clients, would no doubt avail themselves of the opportunities it would afford for information. One of the chief objects of the bureau, for instance, would be the organisation and keeping up to date of returns as to the status of firms abroad. It should also obtain the earliest information from abroad about new business openings, large contracts offering, State and other loan and issue proposals, &c. If it were found that foreign firms were securing business in competition with British firms, or were developing business that British traders were leaving alone, the causes should be at once investigated. The periodical journeys abroad of the Institution's managers and representatives would supplement the information that would be gained through diplomatic and official channels.

The bureau would also have to undertake the examination of industrial projects. This would be a costly business, as it would be necessary to have upon its staff men whose opinion upon technical questions would enable it to investigate thoroughly matters brought up for consideration. It would, however, avail itself of the services of the eminent consulting engineers, consulting chemists, &c., whom we possess in this country.

It is absolutely clear that the personnel of the Institution would call for great discrimination. It seems to be generally agreed that the lines upon which a joint stock bank is constituted would not be applicable in the case of the new concern.

An executive committee consisting of a whole-time chairman and three managing directors would appear essential. (There would probable be three distinct departments, financial, industrial, and commercial. No doubt there would be overlapping between the departments, but this would be immaterial.) They would draw good fixed salaries, and would be entitled to a substantial share in profits. There should be a general board of directors, composed of men with banking, financial, industrial, and commercial knowledge, and in close touch with the leading industries of the country.

Nearly as important as the board would be the general staff. It is fair to assume that women will in the future take a considerable share in purely clerical work, and this fact will enable the Institution to take fuller advantage of the qualifications of its male staff to push its affairs in every quarter of the globe. Youths should not be engaged without a language qualification, and after a few years' training they should be sent abroad. It could probably be arranged that associated banks abroad would agree to employ at each of their principal branches one of the Institution's clerks, not necessarily to remain there for an indefinite period, but to get a knowledge of the trade and characteristics of the country. If industry is to be extended, it is essential that British products should be *pushed*, and manufacturers, merchants, and bankers must combine to push them. It is believed that this pushing could be assisted by the creation of a body of business young men in the way above described.

In this connection it is perhaps worth pointing out that at

the close of the war there may be a considerable number of educated young men who will not be willing to settle down again to the humdrum of an office, and from these it should be possible to select a number who would be desirous of going to the Colonies and foreign countries to push business on their own account. It the case of labouring men, the Government are contemplating the establishment of land settlements, &c., at considerable expense, and similarly it has been suggested that Government assistance might be given to the class above-mentioned, who would probably require the advance of some capital to enable them to make a start. The Institution might act as agent for the Government in this connection. The reluctance on the part of young men to go abroad in recent years has been brought to the Committee's notice, and they think it is very desirable that the spirit of enterprise should be encouraged and that an incentive should be given to them to set up in business in foreign countries.

In the case of young men with some little means of their own, the Institution should be willing—after careful examination of credentials—to grant larger and longer credits than have been customary with existing banks. The principle of becoming special partners in a business for a period of years will be well worth the consideration of the management when the Institution is formed.

The evidence perused by us indicates the necessity for fuller financial facilities for home industries, especially in connection with the enlargement of works and the financing of contracts, and where it is demonstrated that a lock-up of capital for an indefinite period is not involved, assistance might be provided by the Institution to meet these requirements.

If financial assistance is given by the Government to undertakings in connection with what are known as "key" industries, the business should, if possible, be done through the medium of the Institution, and it should be appointed an agent for carrying through foreign commercial and financial transactions in which the Government may be interested.

Foreign banks have, in most of their operations, adopted the course of forming syndicates to undertake any business of considerable magnitude. They have headed such syndicates and they have taken the labouring oar in connection with investigations. The members of the syndicate have generally included other banks, and associated with them have been those who were particularly interested in the class of business proposed to be done. These syndicates are formed after the first superficial inquiry has satisfied the banks that there is apparently a good business to be done. Directly this point is reached the expenditure in connection with thorough investigation is on account of the syndicate. If the business is ultimately proceeded with the profits or losses on the wind-up of the business are shared *pro rata* after allowance to the bank for management. Some such procedure should be followed here. It would enable the Institution to undertake business of a comprehensive character, and its "imprimatur" would have value when issues were made to the public.

Many new undertakings intrinsically sound have been issued in the English market. The capital has been based upon estimates of expenditure made by reputable engineers, but owing to unforeseen circumstances the actual cost has far exceeded those estimates, and, as a consequence, further capital has frequently had to be raised at higher rates of interest and in a form (such as prior lien bonds) which has had a disastrous effect upon the securities originally subscribed for by the public. An Institution issue, whether of debentures or shares, should be an assurance to the public that until final completion there would be no risk of the priorities given at the time of issue being interfered with by pre-preference creations.

We are of opinion that there are strong reasons why the bank should be formed without delay, so that preliminaries may be completed before the war is over. Our enemies are sure to make at the earliest moment strenuous efforts to regain their position in the world of commerce and finance, and it may well be that, when peace comes, unemployment may be rife at home unless new markets are exploited. It seems to us desirable, therefore, to ascertain in advance the requirements of foreign countries and the whereabouts of raw materials for our industries.

We believe that a bank constituted upon the above bases, with efficient management, should not only be a great boon to British trade, but should prove a commercial success.

AMERICAN ELECTRICAL EXPORTS.

WE give below the figures relating to electrical exports from the U.S. in May and June, for which we are indebted to recent issues of the American *Electrical Review and Western Electrician*.

The figures for May show a total far in excess of any previous month. The total value of electrical shipments last May was nearly 91 per cent. over that of May, 1915, and nearly 17 per cent. over that of February, 1916, which was the highest monthly figure previously recorded. The exports for June exceeded in value those of June, 1915, by nearly 54 per cent., though showing a decrease of some 8 per cent. from the record total of May, 1916.

To what extent the electrical export trade is increasing in volume as well as value, it is difficult to state, since the Government reports give the numbers of articles shipped for only four electrical classes. For the classes these numbers compare as follows :—

Articles.	Numbers exported in May, 1916.	May, 1915.	June, 1916.	June, 1915
Electric fans	2,609	2,013	1,977	3,781.
Arc lamps	158	46	16	137
Carbon-filament lamps	79,474	60,496	35,541	74,689
Metal-filament lamps	798,499	257,104	802,640	385,773

In the following table are given the detailed figures for last May and June and for the corresponding months a year ago :—

Articles.	Numbers exported in May, 1916.	May, 1915.	June, 1916.	June, 1915.
Batteries	$157,997	$79,618	$159,876	$113,950
Dynamos or generators	133,534	84,153	145,965	191,464
Fans	33,528	28,838	24,831	48,106
Insulated wire and cable	292,086	302,029	290,151	253,247
Interior wiring supplies, &c. (including fixtures)	38,393	131,600	36,835	70,915
Lamps—Arc	2,539	1,200	156	1,826
Carbon-filament	9,833	7,593	4,188	11,432
Metal-filament	140,649	42,232	133,683	78,596
Meters and other measuring instruments	79,641	67,813	72,540	41,214
Motors	428,984	209,014	321,147	283,923
Telegraph instruments (including wireless apparatus)	16,187	2,968	8,564	1,522
Telephones	358,675	57,090	183,965	44,342
Transformers	173,988	23,217	55,847	70,543
All other	1,572,175	764,844	1,712,396	836,061
Total	$3,437,609	$1,802,209	$3,150,144	$2,047,081

The following table gives a detailed comparison of the last two fiscal years ended June 30th in each case :—

	Electrical exports in 1914-15.	1915-16.
Batteries	$967,146	$1,569,836
Dynamos or generators	2,013,130	1,468,961
Fans	258,309	356,729
Insulated wire and cable	1,911,850	3,157,239
Interior wiring supplies, &c. (including fixtures)	753,351	818,985
Lamps—Arc	30,984	18,693
Carbon-filament	101,923	144,872
Metal-filament	473,149	1,282,039
Meters and other measuring instruments	440,916	776,381
Motors	2,818,743	4,218,974
Telegraph instruments (including wireless apparatus)	76,271	148,536
Telephones	1,149,361	1,329,346
Transformers	624,483	993,193
All other	8,152,141	13,970,236

A comparison of the electrical totals for the last four fiscal years is given below, the year 1912-13 having the preceding highest total :—

Fiscal year.	Electrical exports.
1912-13	$26,772,816
1913-14	25,060,844
1914-15	19,771,757
1915-16	30,254,020

The foregoing figures do not include electric locomotives, which are listed separately. During the fiscal year 1915-16 there were shipped 64 such locomotives, valued at $454,544 ; in 1914-15 these numbers were 43 and $324,478 ; in 1913-14 they were 48 and $437,452 respectively.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Commutator-Slotting Tool.

A writer in the *Electrical Review and Western Electrician* has found that a good and handy tool for cutting down high mica between commutator segments can be made as follows :—

Take a piece of hack-saw blade 2 in. long—a piece with fine teeth is preferable—and grind it down if too thick to go between the

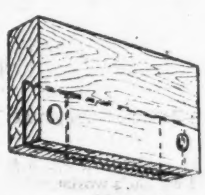

FIG. 1.—COMMUTATOR-SLOTTING TOOL.

segments. Next take a piece of wood 3 in. long, 1·5 in. wide, and 0·75 in. thick, and saw a slot the length of it with a hack-saw deep enough so that the 2-in. piece of saw protrudes $\frac{1}{32}$ in., or more if desired, when it is inserted in the slot. Bore a hole through the wood piece on each end of the piece of saw, as shown in sketch, put in stove bolts, and tighten. This tool can be used on a commutator without removing the brush gear or end casting.

The Sterling Staff-Signalling System.

Facilities to enable the staff of any large works to locate each other at any moment during working hours have for years been badly needed, and although telephones are installed in nearly every works, they do not satisfactorily fulfil the requirements of a busy staff moving about from workshop to workshop.

Suppose that Mr. A., chief mechanical engineer, is going his round in a works of moderate size covering five or six acres. At the moment he happens to find himself in the tool room discussing the requirements of a new tool. He is suddenly urgently required in the main machine shop. How is one to get in touch with him without loss of time? Until recently the most practical method was to go to the nearest telephone, ring up the works central exchange, and ask the operator to try and locate Mr. A. by ringing round to all departments; alternatively, messengers were sent hurriedly through the works.

Both these methods appear antiquated compared with a patented system which we met with when recently visiting the Sterling Telephone Co.'s extensive works at Dagenham. The company has devised an ingenious system of luminous lamp signals fitted at numerous points throughout the works. A bank of five differently coloured electric lamps is fitted in a prominent position at each of

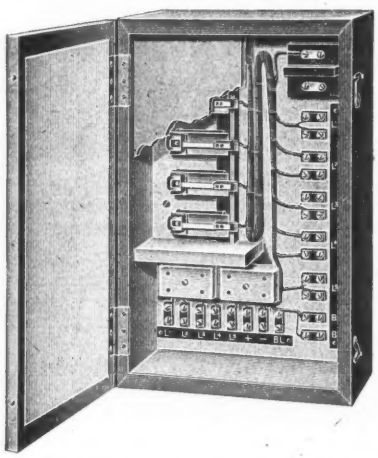

Fig. 2.—Connection-box of Sterling Staff-signalling System.

20 different points in the various shops. A cable connects each point with the works central telephone office. A bell is fitted close to each bank of lamps, or, in the case of a noisy shop, an electric hooter is employed. The central telephone operator is provided with a board fitted with 20 pushes and a special control switch.

When Mr. A. is wanted, the central operator cuts in the control switch and pushes the button corresponding to Mr. A.; her work is then finished for the moment. The bells and hooters in each shop now ring and continue automatically and intermittently to do so until Mr. A. observes that he is required; he then immediately goes to a telephone which is located near the bank of lamps, and calls up the works central, which puts him through to the party desiring to speak to him.

The system is so arranged that 20 different colour combinations can be produced on the bank of five lamps; thus it is that Mr. A., to whom, say, the colours red-blue-yellow have been assigned, knows at a glance when he is wanted. All that is required to make the system perfect is to instruct each member of the staff to glance at the bank of lamps directly the bell or hooter sounds.

It will readily be seen that an enormous saving of time is afforded by the "Sterling staff-signalling system;" any member of the staff can immediately locate any other, irrespective of their position at

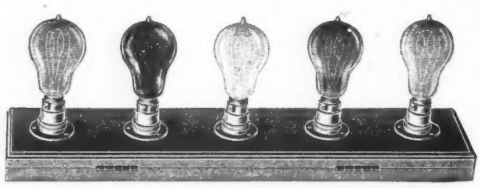

Fig. 3.—Bank of Coloured Lamps.

the time. It would be well worth while for works managers to pay a visit to the Sterling Co.'s works, where they will receive a full explanation of the system. We are informed that the company is prepared to undertake similar installations, provided they are required for munition works. It is obvious that the system is equally applicable to hospitals, and other public institutions.

Concrete Poles.

A new method of making reinforced-concrete poles is described in *Concrete* by L. R. Allison. The poles are composed of one part Portland cement to three of sand and gravel, poured into forms in which the reinforcing rods are supported; the forms are then locked in a machine and revolved at a suitable speed depending on the diameter of the poles, with the result that all voids are filled and a hard, smooth surface is obtained. Obviously the greatest compression is at the point of greatest radius—*i.e.*, the external surface, where it is most needed. After about half an hour the mould is withdrawn from the machine and left to stand for 24 hours; the pole can then be handled safely, and after further setting in the open air, keeping the surface well moistened, is completed. The reinforcement consists of twisted steel rods equally spaced round the circumference at a distance of $\frac{3}{4}$ in. from the outside, the rods being held in place with wire hoops. The poles are hollow from end to end, the diameter of the hole being at least 3 inches. The base and capital of lighting standards are cast separately by the centrifugal process, the former being provided with a cut-out box having a concrete cover. The foundations are cast in position, reinforced with $\frac{3}{8}$-in. twisted steel rods, and the poles are securely anchored to them. The hollow core of the pole accommodates the electric conduit leading to the lamp at the top; when this is in place, the core is filled up with cement grout. Poles of this type are largely used in Californian towns.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

To Go—or Not to Go?

In agreement with the true statements by "Balanced Up," and referring to "North-East Coast's" reply, in which he draws attention to the assertions of eminent men that power station and sub-station operation constitute a field of activity for semi-skilled and unskilled men, I am prompted to draw attention to the conditions existing in a certain electric supply company which in the past has obtained the services of many young trained engineers by the "valuable experience," and alluring prospect of advancement described in its advertisements. This revelation by "North-East Coast" that such "valuable experience" simply consists of semi-skilled and unskilled work, coming from a gentleman who, I presume, occupies an influential position, and originated by the eminent men mentioned in his letter, is apt to be prejudicial to engineers who have sacrificed time and money in station work training. In common with others adopting electrical engineering as a profession, I find, after an experience covering a period of nearly ten years in the technical, constructional, testing, and operative branches that the result of my attraction to this supply company's "valuable experience and alluring prospects of promotion" consists of a so-called salary, or, to be exact, mere pittance, coupled with duties now described as semi-skilled or unskilled. Being prevented, through no fault of my own, from applying my ability to better advantage, during a time when the nation's leaders are urging trained men to give the country the utmost benefit of their skill, I, with many others, am hoping that the military authorities will shortly, by substitution, transfer us from our semi-skilled and unskilled positions to a more useful sphere of activity. I would also like to add that the policy of cheap labour, irrespective of ability, promotes discouragement, consequently reducing the efficiency of the individual engineer, with an increase in the old Capital *versus* Labour feud. This state of affairs does not appear to be a very sound basis on which to meet the enemy in after-the-war competition.

Industrial Conscript (Single).

The Wire-Drawing Industries.

Your remarks in a recent issue under the heading of "The Wire-Drawing Industries" may perhaps do something to waken up the High Conductive Copper Association out of the lethargy which it has sunk into during recent years. It is not to be expected that individual wire firms will be disposed to grapple with this serious growth of foreign aggression while they are members of an association which, while it purports to look after their own interests, still clings to its out-of-date conservative methods when outside competitors have successfully adopted the measures required to put customers' interests first and their own second.

The scope and purposes of the H.C.A. are confined to purely selfish endeavours to prevent internal competition among the big firms in order to keep up prices. If instead, or in addition, it devoted its chief attention to organising a sound policy for frustrating the methods of the German and other foreign wire firms by adopting some of the means by which the latter have become serious competitors in Great Britain and elsewhere, it would be guaranteeing its own success with far greater certainty than by assuring itself that its members are not cutting each other's throats by underselling one another. The fact that the new small firms are doing so well is simply because they creep in under the very noses of the slow-moving big firms, and find new markets which the H.C.A. firms never condescend to look for, or even suspected the existence of. I know one German firm which did more trade with this country three years ago than probably any two H.C.A. firms did in their entire foreign trade.

Its success was due to the fact that it looked after its customers thoroughly, and instead of merely communicating with them through the post (as the English firms would have done) it sent its agents round to its customers to ensure the

attention which all buyers expect and look for. Apparently it is beneath the dignity of the H.C.A. firms to adopt a similar attitude!

The H.C.A. is probably unaware that there are other new small wire firms which would be started at once but for the difficulty of obtaining the rolled copper for drawing down from the big firms. While the H.C.A. is able (at present), because of the monopoly it enjoys through the shutting-out of foreign competition, to prevent other small wire firms being started, by refusing to sell them the rolled copper for drawing down, and thus preventing home competition, it is acting as a monopolist in two ways, *i.e.*, by preventing others from trading where there is legitimate trade to be done and by adopting no proper means of gaining that trade itself. Consequently, the surplus must be going elsewhere—probably to America. This position, however, will cease immediately after the war is over, and then the H.C.A. will have to devise a more up-to-date policy of doing business, and cast overboard many of its present antiquated and unenterprising methods.

Herbert Worthington.

Preston, *September 22nd*, 1916.

LEGAL.

Munitions Court Case.

The Oldham Munitions Tribunal last week heard a complaint by a firm of manufacturers of electric accumulators in the Ashton district, who summoned two labourers for failing to obey orders. According to the assistant works manager, the men were employed in the casting department, and on the 11th inst. they should have left that department to work on a blast furnace, but they refused and went to the office and asked for their wages. A representative of the National Union of General Labourers said the men were told by the foreman there was no further work on their own job. At the casting work their ordinary time was 49 hours per week, and the average wage £2 4s.; but the blast furnace job meant they would have to work from 80 to 88 hours for the same wage. They asked the foreman if there was any other work they could do, and, receiving an answer in the negative, asked for their discharge certificates. Both men now said they were willing to go back to their ordinary work, but a representative of the firm said they could not take them back on the same work, as they had not the material for them to work on.

Mr. James Hodgson (chairman) said there had been no evidence to show that the men refused to obey orders. Before men were removed from one class of work to another the men were entitled to establish a new contract, and the men could not be moved without their consent. The case would be dismissed.

German Electric Patent for Cleaning Boilers.

In the Patents Court, on Friday last, Messrs. J. C. McQuitty, Ltd., of the Albert Engineering Works, Belfast, applied for a licence to use the German patent 3,117 of 1911 for an electric hammer for removing the incrustation in boilers.

Mr. McQuitty described the method on which the hammer works. To the electric motor is attached a flexible tube, having at the other end a hammer-head. The hammer-head does not itself strike. It contains a series of cogged wheels which are electrically driven, and when the hammer-head is brought in contact with the incrustation these tap the scaling as they perform revolutions at the rate of 7,500 taps a minute. The electric energy required is not great. The electric motor is simply coupled to the lighting or power supply of the works, and the result is an efficient mechanism, which is a notable time-saver and performs the work ordinarily done by four men. It gets over the ground rapidly, does not mill, chip, or injure the plating, and, by reason of the flexibility of the tube, reaches awkward places and out-of-the-way corners where it is impossible to make an effective blow with an ordinary hammer. It is known as the Van de Voorde patent. Mr. McQuitty pointed out that it was invaluable for munition works and for naval engineering purposes, and could be used by an unskilled workman.

Mr. McQuitty said his company was a limited company, privately constituted, having only three shareholders, and their business had always included that of millwrights and boiler scalers. He had already made two of these electric hammers experimentally, and he proposed to commission the Westinghouse Co., of Manchester, to provide him with the electric motors. He had never had any engagement with the patentee. He was in negotiation with him before the war broke out, but the negotiations fell through on a question of method of payment. The two experimental hammers which he had made worked quite efficiently. He had some trouble at the beginning because of the inadequacy of the specifications, but he had repaired their omissions, and there was certainly an original element in the hammers as he proposed to put them upon the market. In a further statement, he said he did not know that anyone else was making this type of hammer. There was no English manufacture. The Germans, before the war, and before the prices of material went up, asked £22 10s. for the hammer.

When the Controller asked Mr. McQuitty if he would pay a royalty of 5 per cent., the applicant rejoined that he thought 25s. royalty on each hammer made would be excessive considering the amount of experimental work he had had to do in perfecting the thing, and the fact that he desired to sell it at as cheap a rate as possible. He only got 20 per cent. profit at the present time on his labour in work he did for the Government.

The Controller: An ordinary manufacturer's profit is 25 per cent., and you are entitled to place your royalty on the top of that. The Controller said the applicant must pay to the Public Trustee a royalty of a sovereign on every machine made, and the Court would then recommend the Board of Trade to grant him a licence.

WAR ITEMS.

Exports to China.—The "London Gazette" for September 22nd contains further lists of persons and bodies in China and Liberia to whom exports may be consigned.

Silvertown Employés War Relief Funds.—In connection with these funds, we are informed that £1,500 has been collected to date, and regular donations have been made to the Prince of Wales's Fund, British Red Cross Society, Belgian Relief Fund, Serbian Relief Fund, and the Anglo-Russian Hospital at Petrograd.

Claims Against the Enemy.—The Public Trustee has prepared and issued several documents explaining how claims should be made on behalf of British subjects against enemy subjects and enemy Governments. Our readers do not need to be told how important it is for them to make their claims, and to do so in the proper form. The bill against Germany has to be prepared, it will be a colossal sum, and the work of the Public Trustee Office will be simplified if its instructions are properly complied with. Communications on the matter have to be addressed to the Public Trustee (Trading with the Enemy), Kingsway, W.C., but forms can also be obtained at the Manchester Office, Albert Square, Manchester. It should be noted that shareholders in English companies owning property in enemy territory should not make claims in respect of their individual holdings, as the companies should, of course, make the necessary claims in their corporate capacity.

A Siemens War Savings Association.—Some years prior to the outbreak of war a number of the employés of Messrs. Siemens Bros. & Co., Ltd., formed amongst themselves a Thrift Club, which has had a successful career. As a branch of the club, a War Savings Association has been organised at the Woolwich works under the name of "The Bowater War Savings Association." Its management is exclusively in the hands of a committee of employés, which committee is solely responsible for exact and regular administration. Since the inception, in June last, this Association has progressed well, the membership having increased from 500 to about 1,400, and, up to the present, nearly 4,000 War Savings Certificates have been purchased under the Government Scheme No. 2A, by which all subscriptions, as soon as they are paid, are converted into War Savings Certificates, these being allotted to each subscriber in priority of completed subscription as and when the full value has been paid.

Exemption Applications.—At the Guildford Tribunal, the Woking Electric Supply Co. appealed for its chief clerk (29), the only male clerk left. It was stated to be essential that there should be a man in charge with technical knowledge and an intimate acquaintance with the locality. Appeal dismissed.

When the Imperial Tramways Co. applied to the Stockton-on-Tees Military Tribunal last week for the exemption of a clerk on the ground of indispensability, the manager (Mr. Freshwater) said the company were straining every nerve to release all men possible. They had from 70 to 90 lads in their employ from 16 to 18 years of age whom they were training as motor-men and in other capacities. The moment these lads came of military age they were given their leaving certificates, and the recruiting officer was notified. Exemption until January 1st.

At Maidstone, the Corporation tramways manager appealed for a number of men. Three drivers and a turner were given conditional exemption; and another driver, a clerk, and a blacksmith were refused any time.

West Kent Appeal Court has dismissed an appeal for exemption filed by Mr. G. W. Ironsides (34), electrician, Anerley.

The East Kent Appeal Court has adjourned, for the purpose of obtaining a certificate from the Ministry of Munitions, an appeal by Mr. E. Hunt (27), assistant electrician at the Faversham Cotton Powder Works.

Bromley (Kent) Tribunal, on September 20th, granted three months' exemption to Mr. Riley, electrician, Walter's Yard, and to his electrical machinist, F. Johnson.

Wm. C. Wheeler, electrician, in the employ of Mr. F. H. Norman, Moor Park, Much Hadham (Herts.), has been given

exemption until October 7th, with no further appeal without permission.

At Malvern, on the application of the electrical engineer to the U.D.C. (Mr. S. Trow Smith), conditional exemption was conceded to W. T. Powell, boiler fireman at the electricity and destructor works. A. L. Berridge, shift engineer, also appealed for, was given until December 30th for a substitute to be found.

Mr. R. W. Waine, Bexhill-on-Sea, appealed for Jas. Bloor (35), electrician, passed for labour duty abroad, necessary to the business. On condition that he joined the Volunteer Training Corps Bloor was exempted.

The Chatham and District Tramway Co. appealed for three motor-men and a switchboard attendant. It was stated that five wounded soldiers had been trained as drivers, but it was found that when left to themselves they lost their nerve, and they had to leave the work. Conditional exemption was allowed with the consent of the military representative.

A month's exemption, in order to find a substitute, has been granted by Walton-on-Thames Tribunal to F. G. Fuller (34), electrician to Mr. W. K. Marriott, Moorlands, Cobham.

Before the Warwickshire Appeal Court, the Military appealed against exemption until October 1st granted to Horace Walter Gilbert, electrician and wireman, Rugby, and against exemption allowed to a charge hand at the Rugby Urban Council's refuse destructor. The former case was put back for further consideration, and the latter appeal was allowed, the exemption being limited to October 1st.

At Weymouth, Percy W. Child, electrician, was appealed for by Messrs. Brooking & Co., engaged on a Corporation housing scheme. A month was granted, with no further appeal without consent.

An appeal, at Sheffield, by Mr. W. Johnston (35), electrical engineer, has been respited for the result of a medical examination, and one by Mr. Ernest Jones (33), electrical engineer, has been disallowed.

Before the Essex Appeal Court, Messrs. Taylor, Walker and Co., Upminster, appealed for Albert Robert Barry, their electrician, who was medically rejected when the war broke out. The appeal was dismissed, and consent to go to the Central Tribunal was refused.

Before the Essex Tribunal, Mr. Frank Marwood Burley, electrical engineer, of Southend-on-Sea, appealed for exemption. He said that he was 35 and single, and that his business consisted of putting electrical fittings into houses, and in it was the whole of his capital. He had contracts running, and if he had to close it would be absolute ruin to him. Eighteen months ago he offered to enlist, but then he had someone to take charge of his business. The appeal was dismissed, and a month's grace allowed.

Messrs. Smart & Brown, electrical engineers, Erith, appealed to the West Kent Appeal Court for the exemption of two fitters, aged respectively 20 and 19. Col. Atkinson agreed that the company was doing important Government work, but he could not agree to such young men being indispensable. The appeals were dismissed.

On the ground that he was doing public service in his occupation, Exeter Tribunal has granted exemption until the end of the year to A. Dicker (37), ticket inspector on the Exeter Corporation tramways.

At Honiton, on September 21st, the engineer and manager of the local electricity works appealed for exemption. It was stated that he had total charge of the works, and was the only procurable electrician with sufficient technical knowledge to manage the machinery, &c. He was originally starred, and was in a certified occupation. Appellant was directed to go before the Medical Board and report the result.

At Caterham, on September 21st, Mr. S. B. Howard, manager of the local branch of the Urban Electric Light Supply Co., Ltd., appealed for a stoker and mechanic, aged 28. The Chairman said the Tribunal considered the man in a certified occupation, and conditional exemption would be granted.

Dover Corporation, on September 23rd, appealed for exemption for a driver of an electric scavenging vehicle, who had already had six months, and could not be replaced. The Advisory Committee did not assent. A month was allowed to obtain a substitute.

At Bolton, last week, an appeal was made by a local firm on behalf of a man employed in the making of horse shoes, but the appeal form also stated that the man in question was employed as an electrical engineer. It transpired that he was working as an engineer in the daytime, and at the horse shoe business every night and on Saturdays and Sundays. The Clerk said the firm employing the man in the daytime at his regular work had appealed at Turton for him and had been unsuccessful. It would be a peculiar position if the Bolton Tribunal allowed the claim in respect of the man's spare-time job. The appeal was disallowed.

At Oldham, on September 21st, temporary exemption until December 1st was granted to an electrical engineer and contractor, who is 39 years of age, and said he was doing work for the tramway department, which was work of national importance. The whole of his life's savings were at stake if he had to go away on Army service.

At the Aberdeen City Military Tribunal, Messrs. J. Blaikie and Sons, Ltd., asked exemption for an apprentice electrical engineer and a blacksmith. Mr. H. J. Gray, advocate, stated that before the war the firm had 62 employés, and 31 were now left, 28 having joined the Army or Government service. The firm had been experiencing trade grievances in connection with employing men at electrical work who were not electricians. Mr. McDonald said the Electricians' Trade Union had caused a great deal of trouble. The Chairman: It is an unreasonable attitude to take up in these times. Mr. Gray pointed out that the firm could not overtake the work with the men they had. Mr. McDonald thought the Union was raising all the difficulties it could. The Chairman asked whether a discharged soldier, though a skilled mechanic, could get employment as an electrician. The manager said the Union would not accept a man unless he had served his apprenticeship to that particular trade. The Chairman: That is a disgraceful state of matters. The apprentice electrical engineer's claim was dismissed, with a recommendation for one month, and the blacksmith got temporary exemption for two months.

Referring to the above, the Branch Secretary of the Union has denied that any unreasonable attitude has been taken up by it in this matter; he regards the remarks by several members of the Tribunal as being quite uncalled for. "We have done all within our power to keep matters going smoothly. All our members are either on work of national importance or at the Front. The real grievance is this: While our members are being called to military service, workers employed on alien trades are called to do electrical work. These industrial aliens are eligible for military service. We ask any fair-minded individual to think over this point and then consider whether our protest is reasonable or not."

At Burnley Tribunal, last week, Mr. Mozley, tramways manager, applied for the exemption of three employés, a cashier and two general clerks, aged 30, 28, and 24. Mr. Mozley said they had now got to that stage where they were only left with three clerks, who were the seniors of the staffs. They had lost 10 men for the Army, and four had left for other occupations. The Chairman: Cannot you get women clerks? —It takes a good many years to reach senior positions, where they supervise and check the work of juniors. The Tribunal granted exemption to the end of the year to the senior clerk, two months to the second, and refused in the case of the third.

The Northumberland Appeal Tribunal, sitting at Newcastle, dismissed the appeal of Frederick Nicholls, aged 22, single, who had been a commissioned officer in the Army, had resigned, had entered the employment of Messrs. Armstrong, Whitworth & Co., had been debadged, had gone to a munition factory as timekeeper and checker, and was studying wireless telegraphy at nights. Appellant asked for temporary exemption until January 1st to enable him to undergo a Government wireless examination.

At Southwark, Messrs. Alexander Hawkins & Co., electrical engineers, of London Road, S.E., applied for the exemption of their manager, who previously had been granted an extension. The firm had only asked for the exemption of four men, 15 having joined up. They had tried to get someone to take the man's place, but had failed, although they had advertised extensively. The Mayor said some effort must be made to replace this man, as big operations were going on. Mr. Hawkins said if they were not entirely engaged on Government work he would not have appealed. He had been in the firm's employment for 15 years. One month's exemption was granted to enable the firm to replace the manager.

Mr. F. Freshwater, manager of the Teesside Electric Tramways, in applying at the Stockton Tribunal for the exemption of a clerk, said the man was so indispensable to the company that he was working from early in the morning until late at night. Exemption until January 1st was granted.

At the Richmond (Yorks.) Military Tribunal, a civil engineer who had been engaged for two years at the local military camp, applied for an exemption to enable him to proceed to India to act as assistant engineer in electrical works near Bombay. The engineer there was a single man, and had joined the Colours. Applicant was 32, and had been passed for general service. A strong man was required for the Indian post as there were great risks of fever. If he got the exemption he thought the emigration officer might issue a permit for him to leave the country. The Military representative expressed the opinion that the authorities would not permit such an active man, passed for general service, to go abroad. Exemption until January 1st was granted.

At the City of London Tribunal, Messrs. W. Grantham and Sons, builders and decorators, appealed on behalf of C. H. Dalton, the only electrical engineer in the firm's employ, who was stated to be essential to the business. The Military representative said that the man had registered as a carpenter, but this was explained by Mr. Dalton, who said that he registered as an electrical engineer, but he also put on the paper that he was a carpenter as he was engaged as carpentry instructor at a technical school. Mr. Lister, for the firm, said that if Dalton went they would have to close that department. The Chairman said that the man was a carpenter, and his employers were not electricians. They were described as builders. The case would be disallowed.

At the Stockton-on-Tees Military Tribunal, when the management of a local kinema theatre appealed for a 19-year-old electrician and kinema operator, the Chairman asked how they could send married men into the Army and exempt a man such as applicant. Exemption until November 1st, for arrangements.

The Skelton and Brotton Military Tribunal granted exemption until January 1st to a linesman in the employ of the local Council's electric supply undertaking.

The Rochdale Tribunal has granted conditional exemption to A. Worrall (29), motor-man, and T. Mason (36), wireman, who were appealed for by the Corporation tramways department; and temporary exemption until the end of October to J. E. Kershaw (35), traffic clerk, also appealed for by the department. H. Holden (32), employed in a local mill and, at week-ends only as a motor-man on the Corporation tramways, appealed, and was exempted until the end of November. An appeal by Messrs. Fryer & Hartley for Thos. Hartley (34), electrical wireman and fitter, was withdrawn, the man having now been badged.

At Rawmarsh, on September 22nd, the general manager of the Mexborough and Swinton tramways, was appealed for by the company, and it was stated that the whole of the tramways and the electric lighting were under his control. Conditional exemption was conceded, and also to an electrician engaged at the tramway shed, the only man left to repair wires and cables.

Exemption has been refused to E. C. Stow, electrician, of Halstead, Sevenoaks, appealed for by Mr. J. Russell.

Sevenoaks Tribunal has granted four months' exemption to John Pink (31), electrician to Messrs. S. Young & Son.

Before the Berks. Appeal Court, Mr. R. H. Cain (32), electrician in the service of Princess Hatzfeldt, of Foliejohn Park, Windsor, appealed against refusal of exemption. The Princess also appealed, but exemption was refused.

At Newport (Isle of Wight), Mr. E. W. Tyler, electrical engineer, appealed for his son, Mr. A. Q. Tyler (31), the only man left to do electric light fitting. He said that two sons were serving, and a third was called up for October 1st. Conditional exemption was given.

At Ryde, on September 18th, Messrs. Ashton & Holt, electrical engineers, appealed for Wm. White (24), the only mechanic left. The appeal was dismissed, and the firm were given leave to go to the Hants Tribunal.

At Ventnor, on September 18th, L. J. Boxall, of the staff of the Isle of Wight Electric Light & Power Co., was conceded a certificate of conditional exemption.

At Shanklin (Isle of Wight), on September 20th, Mr. H. Kuping, electrician, was granted conditional exemption on remaining in the Volunteers. The same exemption was conceded to Chas. W. Spencer, apprentice with the Isle of Wight Electric Light & Power Co., his occupation being held to be a certified one.

On the appeal of the Corporation tramway manager (Mr. G. Webster), Rochdale Tribunal has allowed exemption until November 30th to F. Travis (28), traffic clerk.

The Wetherby Tribunal, last week, refused the application—but not to be called up before October 15th—of a butler to Major G. R. Lane-Fox, M.P. (who is on active service). It was stated that the butler had the responsibility for the whole of the electric lighting and heating plant, being the only man left in the house. There was a nominal staff of 86 men, including the Hunt servants; of these 47 had joined the Colours.

At the West Riding Appeal Tribunal, last week, a partner in a private telephone company said last year the two partners realised that one of them would have to go, so it was arranged that the appellant, who had certain domestic responsibilities, should remain to run the concern, and the other partner should go. The appeal for exemption was allowed.

At Morecambe, Mr. H. B. Atkinson (29), electrical engineer, said he was now working single-handed, having the assistance of only a boy of 15. There was no other electrical engineer in Morecambe, apart from the borough engineer. He had been in business eight years, and all his capital was invested in it; he had about 50 installations to attend to in the town. In answer to Dr. Watterson (Military representative), who questioned the work having to be sent out of the town, and suggested that the borough electrical engineer could do it, Mr. Atkinson said that would be a contravention of the law. A little "breeze" occurred when Mr. Ibbotson, the borough accountant, attempted to explain the position of the borough electrical engineer and private work. Conditional exemption was granted.

BUSINESS NOTES.

Trade and Other Conditions in the Argentine.—U.S. Vice-Consul J. S. Calvert, of Buenos Aires, reports that during 1915 American sales to Argentina "increased greatly along certain lines as the result of the absence of competition from some of the belligerent powers. A great deal of this business will probably be kept after peace is declared, as the attention of American manufacturers seems finally to have been directed to this market, but, in some instances, there have been some unfortunate shipments from the standpoint of quality, and in others harsh terms of payment have been exacted to the considerable annoyance of the Argentina firms involved, resulting in general criticism. The situation is not gloomy, however, as the prospects for retaining the business already developed have been made brighter to a considerable extent by the fact that quite a number of American firms last year established in Buenos Aires branches or properly accredited agencies, showing themselves really serious in their desire to enter this market. The practice of relying upon irresponsible or uninterested representatives and, worse still, upon the mailing of catalogues, seems to have died out among American firms really inclined to build up their trade with Argentina. The cardinal rule in exporting goods to this country is that they must be shipped exactly as ordered; no substitution is tolerated. But during the year the Consul's attention was directed several times to cases where the merchandise received was not according to samples submitted when orders were given. It is hardly conceivable that any great number of American manufacturers would, if properly advised by their representatives, fill any orders from this country unless they were in a position to send the exact kind and quality of goods ordered, and nothing else, better or worse."

Mr. Calvert gives in tabular form comparative percentages of imports from the United States in 1913 and 1915. American electric wires and cables which were nil in 1913 were 14.3 per cent. of the total in 1915; various machinery stood at 13.5 per cent. American in 1913, but was 31.9 in 1915; iron and steel wire increased from 40 per cent. to 93.7 per cent.; and steel rails from 21.6 per cent. to 61.7 per cent.

"Iron, steel, and other metal products were imported in smaller quantities than usual in 1915. Very little new construction of any kind took place, and the policy of retrenchment caused by the crisis of 1913 and prolonged by the outbreak of the war was continued. The United States, however, got a fair share of the business, and increased materially its exports to Argentina of sheet iron and steel, tin plate, and wire."

The report later states that during 1915 trade between the United States and Argentina developed to a considerable extent in articles in which in former years the trade was negligible. Among them may be mentioned miscellaneous machinery and machines, chemicals, and automobiles.

"A great deal of this business will be permanently held, and may be, in fact, increased. . . . Miscellaneous machinery, machines, implements, devices, and specialities, not specifically mentioned, form, it is believed, quite a large part of the total imports from America. At any rate, these articles are seen in ever-increasing numbers in the shop windows and stores of Buenos Aires. Their good quality seems to be generally accepted, the only hindrance to their more extensive sale being the high and uniform prices that are charged for them in the shops. Taken as a whole, the year 1915 was a very good one for American trade in Argentina, and the prospects of its continued growth are favourable."

Mr. Calvert, in referring to industrial and economic conditions, says that despite its large exports the country has not yet regained its former economic position. Conditions are steadily improving. The value of goods imported during the year was small, and stocks were allowed to get low. There is a much brighter outlook for 1916, and "it is confidently expected that from now on the situation will improve, that business in all lines will grow, and that soon the country will find itself in a much sounder condition than prior to the panic of 1913, which was brought on largely by speculation and injudicious promotion. A good sign of the gradual improvement is found in the drop in the number of commercial failures during 1915.

"The raising of funds on long terms for Governmental purposes or important private projects is still a matter of securing outside capital, and the restricted amount of European capital available is not sufficient for the rapid development of the country's resources, nor, in fact, for the completion of some works in course of construction. During the year the question of obtaining American capital to replace the European aroused considerable interest among the Argentine public, and, as a matter of fact, reached a concrete form through the action of American bankers in placing several loans for the Argentine Government. There has not been, however, so far as can be learned, any considerable investment of American capital in private undertakings."

The report says that the latest telephone census shows that there are 71 establishments in the Republic, with a capital of £2,951,086, employing 4,494 persons at a total wage of £390,640 per annum. "In Buenos Aires two systems are in operation—the Compañia Unión Telefónica, and the Compañia Cooperativa. The former, which is the largest, also maintains exchanges in Rosario, Bahia Blanca, La Plata, Cordoba, and other cities of the Republic. It is understood that efforts are being made to secure a concession for the installation of a new service, using automatic instruments of American make, in the city of Buenos Aires."

For Sale.—Messrs. Wheatley Kirk, Price & Co. have issued a catalogue of electric cables, fittings, &c., that are being sold by tender by order of the Controller of Turner & Burger, London.

Patents and Alien Enemies.—Application has been made to the Board of Trade to avoid or suspend Patents Nos. 11,530/13 and 11,615/13, granted to the Farbenfabriken vorm. F. Bayer & Co. for the vulcanisation of caoutchouc, by Mr. A. Smith, of Excelsior Works, Clayton, Manchester, who has also applied for the grant of a licence in respect of patents Nos. 12,777/13 and 12,661/14, granted to the same firm for vulcanising processes.

A Kingsway Insurance Office.—In the past the whole of the headquarters staff of the British Engine, Boiler and Electrical Insurance Co., Ltd., with which the name of Michael Longridge is inseparably associated, has been stationed at Manchester, and all technical matters have had to be dealt with there. It will readily be recognised that in the case of business in London and other centres situated at a distance from Manchester, the passing on of matters, say, for example, urgent communications respecting an electrical breakdown, or the discussion of complicated technical points, involved delays, and, perhaps, laborious correspondence. The company, which is already so well known to steam and electrical plant users, and particularly to our readers, by reason of the excellent reports of breakdowns that we were annually permitted to publish until comparatively recently, has struck out progressively, in order to obviate the above disadvantages, and thus better meet the requirements of its increasing business in the London area, by opening a larger office than formerly in London, with a complete staff for dealing with the inspection and insurance of all kinds of electrical plant. We paid a visit to the premises, which are in a thoroughfare which is becoming more highly charged electrically as the years pass by, and would have been more so by now with the completion of the G.E.C. new offices if the war had not interfered, at Imperial Buildings, 56, Kingsway, W.C. The guidance of this technical department has been placed in the hands of Mr. H. Llewellyn T. Foster, M.Inst.C.E., M.I.E.E., formerly the chief electrical engineer of the company at their head office at Manchester. Mr. Foster, in the course of somewhere about 30 years' experience of British electrical machinery and plant, has naturally accumulated a very wide practical experience of many types of manufactures which stands him in excellent stead in dealing with insurance questions in connection therewith, and he, with his staff of inspectors, will be available in readiness for handling matters of emergency with expedition and skill. Mr. H. F. Taylor, formerly secretary to the company, has been appointed to take charge of the new London office, and with him is associated Mr. W. J. Walsh as assistant manager. These two gentlemen have likewise migrated from Manchester. Considering the difficulties of securing workers in war-time, the matter of engaging a suitable office staff has been well handled, and with every modern office equipment, and an excellent system of electrical illumination, a good start has been made in setting a new organisation to work amid congenial surroundings.

The German Cable Makers' Syndicate.—The agreement of the Syndicate of Cable Makers, to which all the large German electrical firms belong, would nominally expire with the end of September. Negotiations, however, have been proceeding with a view to a further provisional extension of the Syndicate for a period of six months, a definite prolongation being postponed until after the war. The situation of new business under existing conditions is characterised as very quiet. It is also reported that the Syndicate of Makers of Insulated Conductors has been renewed until the end of June, 1917.

Concordia Electric Wire Co., Ltd.—A notice, dated September 20th, issued by the secretary of this company, announces, by direction of the Public Trustee, that a British syndicate has purchased the shares vested in him under the powers conferred by the Trading with the Enemy Amendment Act, 1916. Pending the reconstitution of the board, no orders will be recognised by the company unless they are issued on the official order forms of the company, signed by Mr. R. Belcher, one of the existing directors, and countersigned by Mr. Leonard Thornton, the secretary.

Book Notices.—*Whittaker's Arithmetic of Electrical Engineering.* London: Whittaker & Co. Price 2s. net.—This is the third edition of a useful collection of examples, examination questions, &c., many of which are worked out in full. In the new issue two new chapters have been inserted, dealing respectively with electricity supply economics and illumination, and a considerable addition has been made to the number of exercises.

The Indicator Handbook. By C. N. Pickworth. Manchester: Emmott & Co., Ltd. Price 3s. net.—This, the fifth edition, has been brought up to date, and a note has been added on recording indicators which are actuated electrically. The book is one of those which merit the title of "standard" works, and is indispensable to the user of the indicator.

"The Fan, including the Theory and Practice of Centrifugal and Axial Fans." By C. H. Innes. London: The Technical Publishing Co., Ltd. Price 8s. 6d. net.

Trade Announcements.—It is officially announced that the Board of the British Mannesman Tube Co. has been reconstituted, and the directors are now:—Mr. Richard S. Guinness (chairman), Sir Robert Balfour, Bart., M.P., Sir Hugh Bell, Bart., and Mr. G. Hethey (managing director). Mr. Hugh W. Dunn will continue to act as secretary.

Mr. F. J. Roden has resigned his position as a director of the E.S. Co., Ltd., of "The Light House," 233, Tottenham Court Road, W., and his interest in the business has been taken over by Mr. E. Cecil Beman, the managing director, who will be entirely responsible for the direction and control of the company.

Messrs. George Ellison, of Birmingham, have removed their Yorkshire Branch Office from Sheffield to Standard Buildings, City Square, Leeds.

Mr. Edwin T. Lindow, electrical engineer and contractor, has removed to 87, Parkhurst Road, Holloway, N.

Bankruptcy Proceedings.—Thomas Brookes, Halesowen, electrician at munition works.—First meeting, September 29th; public examination, October 25th.

The Electrical Company's Stock for Sale.—Messrs. Wheatley Kirk, Price & Co. are offering for sale by public tender the business, British trade connections, and stock of the Electrical Co., Ltd. Full particulars are given in our advertisement pages to-day.

Catalogues and Lists.—Carron Co., Carron, Falkirk.—New seasonal catalogue of electric heating appliances. In the course of 24 pages, illustrated, particulars and prices are given of various designs of luminous radiators, electric stoves, electric fire interiors, electric fires, Carron elements, dog grates, and electric fireplace suites. Several new models are shown, but the particular feature of the list is the Carron electric fire interior.

Messrs. Credenda Conduits Co., Ltd., Chester Street, Aston, Birmingham.—Leaflet illustrating new designs in electric fires, for which the London agents are Messrs. Baxter & Caunter, Ltd.

Trade with Russia.—A representative of the British Board of Trade has arrived at Nijni Novgorod with the object of establishing direct trading relations between the Russian and British markets. For next year's Fair, the British Board of Trade will organise an exhibition of British manufactures which can be exported to Russia.—*Times.*

The *Daily Chronicle* says that at present two representatives of the Indian Government, Messrs. Blake and Chadwick, are in Petrograd on a special mission of study and inquiry into the possibilities of future trade intercourse between Russia and the Indian Empire.

Private Arrangements.—J. W. Simpson, 5, King Street, Margate, electrician.—A circular, dated September 25th, has been issued to the creditors herein by Messrs. Poppleton, Appleby and Hawkins, of 4, Charterhouse Square, E.C., stating that Mr. Simpson has consulted them respecting his affairs, as they are representing several of his trade creditors, and in order to protect the estate, the debtor, on the advice of his solicitor, has executed a deed of assignment to Mr. E. H. Hawkins, as trustee for the creditors, in consequence of one execution having been levied and others pending. As a result of negotiations with the execution creditor, a satisfactory arrangement has been made whereby the execution will be withdrawn on terms, and it is proposed that the estate shall be wound up under the deed, an offer having been made for the purchase of the stock and fixtures by private treaty. The other assets consist of book-debts, which the trustee will collect, and in three months' time it will be possible to close the estate and distribute a dividend. The debtor states that his unsecured liabilities amount to £363 and the assets to £265, subject to preferential claims of about £100. The largest trade creditors have approved of the arrangements that have been made.

LIGHTING AND POWER NOTES.

Aldershot.—The electrical engineer has been instructed to present a full report on the present position and future requirements of the electric light undertaking.

Bedford.—Loan Sanction, &c.—The Finance Committee reports that application has been made to the L.G.B. for sanction to borrow £3,900, in connection with the electricity undertaking, and that sanction has been granted for £4,072. It will, therefore, be necessary to include in the revised estimate the sum of £828, the amount disallowed, to meet which the Committee recommends that the present increase of 5 per cent. on the electric light charges be increased to 10 per cent., until further notice. The recommendation was referred to a Committee of the whole Council. The Committee stated that inquiries were being made by contractors regarding a supply of energy for lighting, power and cooking purposes for a new factory, and when it was ascertained what would be required and what the firm would be prepared to pay, the matter would be laid before the Council. The engineer has been directed to make house connections in all cases he deemed proper, on condition that the whole capital expenditure in connection therewith should be borne by the applicants.

Bispham.—Price Increase.—The U.D.C. has decided to increase the charges for electricity from October 1st, owing to the increased cost of production as follows:—For lighting purposes by 1d. per unit; for other purposes by 20 per cent.

Canada.—The Attorney-General for Ontario has rejected an application of the Electrical Development Co. for permission to take action in the Ontario Courts as to the right of the Hydro-Electric Commission to undertake the proposed Chippewa-Niagara development. It is also stated that the Province of Ontario would oppose any application to the Dominion Government for disallowance of legislation passed by the Ottawa Legislature last session.

Colombia.—The Municipal Council of Zaragoza Department of Antioquia has been authorised to raise a loan of £3,000, for the installation of an electric power plant and the construction of an aqueduct.

The Municipal Councils of Mosquera (Cundinamarca) and Concepcion (Antioquia) are borrowing £2,000 and £1,000 respectively for electricity purposes.—*Board of Trade Journal.*

Crayford.—Public Lighting.—The P.C. has approved of a draft five years' agreement with the West Kent Electric Co. for lighting the roads on the new estate at Barnes Cray.

Continental.—Spain. — Application has recently been made for a concession to utilise the water power of the River Cadagua, in the Valle de Mena (Province of Vizcaya), for the generation of electrical energy for lighting and power purposes in the town and district of Nara.

The Sociedad Anonima Portland Iberia has set up a very complete Portland cement factory at Castillejo, some 60 miles distant from Madrid, on the River Tajo, whose waters are utilised in connection with a hydroelectric station, to drive the plant, which is capable of an output of 60,000 tons of cement yearly. The specifically cement-making plant has been supplied by the firm of F. L. Smith, of Copenhagen; the hydroelectric and electric plant by E. Grasset & Co. and Brown, Boveri & Co. There are three groups of Francis turbines, driving Brown, Boveri alternators. The pressure of the alternators is 3,150 volts, raised for transmission to 30,000 volts, three-phase. The electromotors are coupled direct to the machines they drive. They are non-synchronous motors of Brown, Boveri make.—*Industria e Invenciones.*

Norway.—The town authorities of Drammen have voted 1,073,000 kroner for various works, with a view to utilising additional power from the commune's power station at Labro.

The municipal authorities of Aalesund have voted a sum of 528,300 kroner for the building of a hydro-electric station on the Spilkevik River, the erection of transmission lines, &c.

The commune of Fjeld has decided to expend 300,000 kroner on an electric supply scheme.

The district authorities of Grytten have arranged to purchase the Stavemfos waterfall and erect an electric generating station.

Crompton.—E.L. Proposals.—The Electricity Committee of the Oldham T.C. has expressed its willingness to meet a deputation from the U.D.C. to discuss the question of supplying electricity to the district. The request of certain local manufacturing firms that Oldham should supply the electrical energy required at Shaw station for a loading crane was supported by the U.D.C., but the Corporation cannot see its way to supply the station alone owing to the small demand. It is understood that the residents of Shaw are anxious to obtain a supply of electricity, and the Corporation is evidently prepared to make the necessary arrangements provided suitable terms can be arranged with the U.D.C.

Croydon.—The Electricity Committee has decided to accept the offer of Messrs. Callender to lay a new H.T. feeder from the generating station to the sub-station in Southbridge Road, the total cost, with provision for public street lighting, being estimated at £1,535, which is to be charged to reserve.

Dover.—Price Increase.—The T.C. has decided, in order to meet expenditure, to increase the price of current supplied to private consumers, the tramway, and for power by ½d. per unit, and for heating from 2d. and 1d. to 2d. and 1½d.

Haslingden.—An anonymous donor has forwarded a cheque for 50 guineas for the purchase of an electrical machine for use in the massage department of the Auxiliary Military Hospital during the war, and afterwards for private use by Miss Harrison, the masseuse at the hospital.

Heston and Isleworth.—The electrical engineer reported that the estimated loss of revenue through the non-lighting of the street lamps in the September quarter was £244, and the net loss £174. The Council agreed that the works department should bear half the loss.

London.—Stoke Newington.—There was a surplus of £1,023 on the year's working of the electricity undertaking; £500 has been allocated to reserve, £500 to reduction of rates, and the balance carried forward.

The Finance Committee has received a claim from the Inland Revenue authorities for £350, excess profits tax in respect of 1915, based on a three years' average.

Poplar.—The Electricity Committee has considered a report by the engineer on extensions required to meet increasing demands, the installation of an additional 6,000-kw. set is estimated to cost, under present conditions, £76,500, of which £64,750 would be chargeable to loan account. As an alternative the engineer suggests linking-up with the L.C.C. tramway generating station at Greenwich, which would involve a capital expenditure by the Council of about £8,100. The Committee stated that if this scheme is adopted it would be of advantage to both undertakings, the peak of the load at the two stations occurring at different hours; the engineer is to continue negotiations with a view to its adoption. The Committee recommends the provision of a Lee recorder on the turbines in the old engine room. The Committee arranged for the provision of an electrical exhibit—jointly with Stepney B.C.—at the National Economy Exhibition at the People's Palace.

Acting in collaboration, the engineers of the Poplar and Stepney Borough Council electricity departments have got together a very attractive exhibit, comprising lighting fittings, motors, vacuum cleaners, and a great variety of heating and cooking apparatus, representing most of the well-known makers. Electric irons, of which a considerable number are used in these districts, form a prominent feature of the show, the ease with which they are coupled up to a lampholder and put to good service being demonstrated by a young lady. It is remarkable how a living exhibit of this kind appeals to the passing crowd. Actual demonstrations of the cooking of cakes, boiling water, &c., are also given. The engineers in charge of the stand report that good work is being done in educating the public to a due appreciation of the convenience and other advantages of electricity in heating and cooking—the lighting speaks for itself; in addition to the local visitors many West-End residents have called at the stand, a fact which emphasises the importance of efficient collaboration between all the metropolitan supply undertakings—for this East-End exhibition is thus directly benefiting the West-End supply authorities, at no cost to the latter, and the service should be reciprocated. Clear evidence is afforded by the exhibits of the progress that is being made in the design of heating and cooking apparatus. Poplar having led the way in connection with "halfpenny units," it is pleasing to record that excellent results are being obtained; the lighting charges have not been increased during the war, and the power charges, in spite of the great cost of coal, have only been advanced 10 per cent.

Kensington.—The B.C. has been recommended to agree to the proposal of the Notting Hill Electric Lighting Co., Ltd., to increase the charge for electric current by a further 10 per cent., bringing the price to 6d. per unit.

Ormskirk.—The B. of G. has decided to ask the Chloride Electrical Storage Co. to put the battery in order, under the terms of the maintenance agreement, and is to employ Mr. Gibbs, who has been appointed consulting engineer, to superintend the work.

Rawtenstall.—Linking Up. — The engineer recently reported that the original scheme for the supply of electricity to Haslingden had been amended in order that Rawtenstall electricity undertaking might be linked up with the Accrington undertaking. A larger cable has been laid, and additional switchgear will be necessary; application is to be made to the L.G.B. for sanction to borrow £400 for this work.

Rochdale.—Works Extensions.—At a meeting of the Gas and Electricity Committee the Works Sub-Committee reported against the recommendation of the borough electrical engineer that the full scheme of electricity works extensions and improvements (recently suggested as desirable by an expert adviser), should be carried out, and the report was adopted. The full scheme was estimated to cost £60,000; the smaller scheme, now in hand, is estimated to cost £10,000.

Shipston-on-Stour.—A meeting was held on September 21st to consider the desirability of taking over the plant of the Electricity Co. and amalgamating the concern with that of the Gas Co. It was announced that the directors of the Gas Co. would be pleased to amalgamate if the proposals were considered to be suitable. A provisional Committee was appointed to go thoroughly into the matter.

Southampton.—The question of coal storage at the electricity works is causing difficulty, and the Committee is approaching the Railway Co. to extend its sidings. In connection with a new arrangement for dealing with the ashes in the boiler-house, it will be necessary to install an elevator similar to the one now at work. The engineer reports that cable faults developed in the Western Shore Road recently, between the West Station and the works, and near the Baths; it was found that continuous flooding by sea water had caused deterioration of some of the cable, and the engineer has been authorised to renew it at a cost of nearly £300. The Committee authorised him to carry out the works suggested.

Walton-on-Thames.—Price Increase.—The B. of T. has informed the U.D.C. that it has consented to the varying of the maximum prices in the local Electricity Supply Order, the price for September 30th to be 7d. per unit.

West Ham.—Price Increases.—The E.L. Committee has decided to recommended a general increase in the rates charged for electricity. The engineer has arranged for the rewinding by the contractors of the 5,000-kw. turbo-alternator which failed, and is to make arrangements for the repair of No. 6 engine.

Wigan. — Loan Application, &c. — The T.C. has decided to apply to the L.G.B. for sanction to borrow £11,038 for a cable to connect Hindley and Ince to the Corporation generating station, and to provide transformers and switchgear.

At a special meeting of the T.C. on Wednesday last week, the chairman of the Electricity Committee, in proposing the adoption of the minutes of that Committee, stated that it had been found imperative to terminate the appointment of the electrical engineer, and further tendered his own resignation, if it was considered that he was partially responsible for the situation which had arisen.

TRAMWAY and RAILWAY NOTES.

Blackpool.—Traffic Records.—Figures presented to the Tramways Committee, on September 21st, show that during the four weeks ending September 14th the receipts were £18,906, compared with £14,967 last year, an increase of £3,939, or nearly £1,000 a week. The receipts per car-mile reached the high figure of 2s. 10¾d., an increase of 4d. From April 1st to September 14th the receipts were £65,508, compared with £53,379, an increase of £12,129. The passengers carried numbered 10,230,229, compared with 7,884,432, an increase of 2,345,797. The takings per car-mile were 2s. 2d., an increase of 2¼d.

Cardiff.—Accident.—On Saturday last a car was proceeding at a moderate speed, when the overhead trolley-arm left the wire and swung with great violence against an iron standard. The arm was broken off and fell on top of the car, inflicting face and head injuries on four passengers.

Clayton-le-Moors.—The Lancs. and Yorks. Railway Co. has applied to the B. of T. for an extension of time until June 5th, 1918, for completing the works authorised in the Clayton-le-Moors Light Railways Order, 1912, which includes work in the districts of Clayton-le-Moors U.D.C., Burnley R.D.C., and in the Borough of Accrington.

East Ham.—Halfpenny Fares.—The Council has considered the question of the abolition of halfpenny tramway fares and stages; in view of the fact that up to the present the L.C.C. has not arrived at any definite decision on this question, further consideration has been deferred, and the Mayor, the chairman of the Tramways Committee, and the engineer have been appointed to attend any conference of the metropolitan boroughs that may be convened on this question.

Glasgow.—At its last meeting the T.C., by a large majority, decided to increase the working hours of the tramway department from 51 to 54 per week, except in the cases of permanent-way labourers, mains and cable labourers, and red-leaders, in whose cases the hours were raised to 56, and to pay a war bonus of 2s. to the men and 1s. to the women. It was explained by ex-Bailie Montgomery, the convener, that even this increase did not bring the employés up to the standard of the working hours in similar undertakings. For the extra three hours it was proposed to pay time and a half. The addition to the wages bill would be £44,408, and the net cost, allowing for the value of the three extra hours' work, would be £25,393. The increases represented an advance of 41 per cent. on the wages since June, 1914

It was reported at the T.C. meeting that altogether 1,991 women had been engaged, 630 had resigned, and 85 had been dismissed; there were now 1,385 women on the cars, of whom about 150 were employed as drivers.

Lowestoft.—The tramway receipts for the four weeks ended July 22nd totalled £631, comparing with £801 for the corresponding period last year. To September 9th the receipts were £6,809, as compared with £8,739. The Tramways Committee has recommended that £750 be provided in the borough rate on account of the deficiency; it has been decided that from October 1st the cars shall cease running at 8 p.m. The tramway manager has been instructed to employ women drivers if necessary.

Oldham.—Female Labour.—Six female car cleaners have now been put on for night shift work at the sheds, in addition to the female car cleaners who work through the day. The manager reports difficulty in getting suitable women as car conductors, and he told his Committee that Manchester and Preston appeared to be experiencing the same difficulty.

Rochdale.—The Tramways Committee has refused an application by the local branch of the Tramway and Vehicle Workers' Union for an increase of wages for the workers in the tramway department.

Collision.—Two cars came into collision on the Spotland route on Sunday night, and considerable damage was done to both of them. The drivers were injured, and had to be taken to the infirmary.

Rotherham.—Collision.—On Saturday last, as a result of a collision between two cars on the Dalton section of the Corporation tramways, five women and two children were slightly injured.

Swansea.—Tramway Leases.—The B.C. has received a recommendation of the Tramways and Electric Lighting Committee that new leases be granted by the Corporation to the Swansea Improvements and Tramways Co. of (*a*) the tramways included in the tramway lease dated October 23rd, 1906; (*b*) the light railways and electrical equipment included in the light railway lease of October 23rd, 1906; and (*c*) the tramways recently constructed under the Swansea Corporation Act, 1912, and that the existing tramway and light railway leases should be surrendered. For the sake of economy the Council resolved that one new lease be granted, and that if such a course is not practicable the three new leases be granted.

TELEGRAPH and TELEPHONE NOTES.

Breakage of Insulators.—During the hearing of a case at Oldham Police Court, in which a boy was summoned and fined for damaging insulators on the telegraph poles, it was stated that about 1,000 insulators in Oldham had been broken during the past 12 months.

New Zealand.—The Telegraph Money Order Service, which was instituted on July 1st last with certain of the British Oversea Dominions, will be extended on October 2nd to British Guiana and New Zealand. The transmission of the telegrams of advice at the deferred rates reduces the charges by one-half.

Norway.—A contract has been concluded, through the firm of A. B. Laurentzon, with the Western Electric Co., for the building of a new telephone exchange in the town of Hamar.

Science in France.—The French recognition of the need for a closer harnessing of science in the service of electricity is shown by a recent decree signed by the President of the Republic. In his covering letter to the President, the Minister of Commerce, Industry, and Telegraphs states that the war has exercised a real influence on the rapidity of the progress accomplished in the last two years in telegraphy and telephony; it has led scientists and technicians, whose labours were formerly directed elsewhere, to occupy themselves with problems raised by these subjects and radiography. It has also definitely affirmed the need for a collaboration of science, industry, and the public services. Hence it is needful to call for the assistance of eminent scientific and technical persons for the settlement of such problems as are raised by telegraphy and postal equipment, and that their services to this end should be retained permanently. Then follows the indication of the creation of a single Technical Committee, in six sections, in the room of the several Committees formed at various periods previously. It is incidentally remarked that the staff of the Administration of Posts and Telegraphs has grown from 75,000 in 1895 to 135,000 at the present time.

Telephone-tapping.—On September 25th, charges of unlawfully having plans and telephone-tapping apparatus in his possession, which had been preferred against John Yeardye, an inspector of works, were withdrawn by the military authorities, who ascribed the incident to Yeardye's carelessness and inquisitiveness.

Wireless Telegraph Patent Decision.—The all-important "valve" patents have been occupying the Courts of the United States for a considerable time in an action brought by the Marconi Co. against Dr. Lee De Forest for an infringement of their Fleming patents, and a counter-action by De Forest claiming damages for infringement by the Marconi Co. Judgment was given last week in favour of the Marconi Co. Dr. Fleming's patents were declared to be master patents, not anticipated by De Forest or anybody else. The De Forest Audion was held to be an infringement of the Marconi Co.'s Fleming patents.

The Atlantic Communication Co. of America, a subsidiary company of the Telefunken Co. of Berlin, has infringed a number of patents in order to obtain a possible wireless service across the Atlantic, and fearing an action by the Marconi Co. against it which is pending, recently purchased the De Forest patents for the sum of $150,000.

Dr. Fleming's "valve," and many infringements of it, have been largely responsible for the developments in the reception of wireless telegraphic messages over long distances. It was the introduction of these "valves" which gave a value to the Poulsen system, and has been principally responsible for such success as the Germans have obtained both abroad and at home in wireless telegraphy. We are informed that the experiments recently carried out in wireless telephony in the United States, which gave sensational results, were achieved solely by the use of the Marconi Co.'s Fleming valve patents.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney.—January 22nd, 1917. Electrical plant (converter, battery, booster, and switchboards) for the Castlereagh Street sub-station, for the Municipal Council. Specification from E.L. Department, Town Hall.*

Melbourne.—September 29th. City Council. Insulated and H.D. copper cables. See "Official Notices" September 8th.

October 17th. For the Deputy P.M.G. (1) Sleeves and tapes (Sched. No. 1,355), and (2) 3,100 stay-rods, with low tighteners (Sched. No. 1,359).*

October 18th. Victorian Government Railways. Electric time releasing mechanisms for automatic signalling (Cont. No. 30,343).* November 1st. 50,000 yellow flame arc carbons.*

December 11th. City Council. Supply and erection of coal transporter plant. See "Official Notices" September 15th.

Perth.—November 8th. P.M.G. Accumulator parts (Schedule 527 W.A.).*

South Australia.—November 15th. P.M.G.'s Department. Automatic switchboards and all associated apparatus, for telephone exchanges, Brighton and Glenelg.

Grenada.—October 31st. The Government of Grenada, British West Indies, is inviting proposals for supplying electricity for lighting and power in the town of St. Georges, Grenada, and residential suburbs within a radius of three miles. Plan and particulars, £2 2s. Tenders to Colonial Secretary, Grenada, British West Indies.

Halifax.—September 28th. L. and Y. Railway. Twelve months' supply of steel sheets (Siemens and electrical), schedule 51. Mr. Warino, stores department, Osborne Street, Manchester.

Johannesburg.—Municipal Council. Twelve gross of carbon brushes for electric motors. (Contract No. 178.)*

New Zealand.—Wellington. October 11th. Public Service Stores Tender Board. 1,000 magneto extension bells, 1,000 ohms.*

Paris.—October 2nd. Four lots of rubber-insulated telephone cables. Particulars from the Direction de l'Exploitation Téléphonique 2e Bureau, 103, Rue de Grenelle, Paris.

October 2nd. Nineteen lots of paper-insulated, lead-covered electric cables (one lot relates to the transformation of old material). Particulars as above.

October 7th. Thirty-three lots of porcelain or glass double and single bell insulators. Particulars as above.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Faversham.—T.C. 500 tons of Welsh coal for the electricity works: Messrs. Davis, £2 1s. 6d. per ton.

Glasgow.—Tramways Committee. Tenders accepted:—

V.I.R. cable.—Pirelli, Ltd.
Chilled-iron brake blocks.—Miller & Co.

Johannesburg.—The Town Council Works Committee proposed to accept an offer of the South African General Electric Co. to let on hire an electrically-driven vehicle for street-watering purposes for £10, plus £12 for a driver, and £15 for garaging, charging, oiling and greasing—total £37. To mount a 450-gallon tank with a sprinkler on the vehicle will cost £6 10s. The purpose of the Committee is to make a comparison of cost between horse and motor-driven traction.

London.—Poplar.—The Electricity Committee reports having invited tenders from 15 firms for the provision of ash-handling plant at the generating station, but two tenders only have been received, nearly all the firms being fully occupied with war work. Only one of the tenders received is complete. The most complete scheme is that of Messrs. Strachan & Henshaw, of Bristol, at a total estimated cost of £3,855. An alternative scheme for loading into wagons only, with grab, but allowing in construction for eventual extension in accordance with the complete specification, has been obtained, the estimated cost, exclusive of foundations, being £1,419. With the foundations, the total cost of the scheme is estimated at £1,600. The plant is necessary to enable the motor-wagons obtained for removal of ashes, and now loaded by manual labour, to be fully and economically utilised. The Committee recommends that ash-handling plant, as specified, be obtained and erected at a total estimated cost of £1,600.

Southwark.—The Electric Light Committee has accepted the following tenders for coal:—Messrs. G. Hinchliffe & Co., supply during 12 months of 7,000 tons Midlands 1½-in. slack, at 21s. 11d. per ton; and Messrs. E. Foster & Co., supply during 12 months of 2,000 tons West Cannock 2-in. slack, at 22s. 5d. per ton.

New Zealand.—Wellington.—The following tenders have been accepted by the Public Works Department:—

Bare copper wire and cable, £2,140.—S. Brown, Ltd.
Braided cable, £3,853.—Lawrence & Hanson Electrical Co., Ltd.
Insulated cable, £2,876.—Turnbull & Jones, Ltd.

—*New Zealand Shipping and Commerce.*

Southampton.—The contractors for installing electric light at the Eastern District School have written stating that when tendering they had a favourable offer for tubes, fittings, &c., which has since been withdrawn, and in the circumstances they must withdraw their tender or increase the amount by £55. A sub-committee is considering the matter.

Tenders accepted for coal for the electricity works:—

Usher & Co.—1,800 tons Bolsover 1½-in. slack, 23s. 6d. per ton.
Cory Bros. & Co.—1,000 tons Ibstock D.S. nuts, 27s. 6d. per ton.
Stewart & Co.—900 tons Stockingford nuts, 27s. 6d. per ton.
Bradbury & Co.—900 tons Measham nuts, 28s. 2d. per ton.

NOTES.

On Setting the Clocks Back.—Mr. F. Hope-Jones, M.I.E.E., M.Brit.Hor.Inst., kindly sends us the following hints on the proper method of restoring our clocks and watches to the paths of probity and rectitude:—

Many millions of clocks and watches will be set back an hour on Saturday night at the end of the month, and there is no doubt that some damage and much inconvenience will be caused by careless handling of them, particularly in the case of striking clocks.

Watches and time-pieces—the latter easily distinguishable by the fact that they have but one key-winding hole—can be turned back an hour without fear of damage, because the hands are spring-tight upon the axles of the wheels.

Striking clocks are of two kinds, one in which the hourly programme is dictated by a snail and rack, and the other which accomplishes it by means of a "dividing" or "locking" plate. In the latter, when you turn back the hands you do not carry the striking part with them, and if they are once out of phase with the striking, they will not right themselves.

If you are in doubt as to which of the two classes your striking clock belongs to, and none but a professional watch and clock maker or an expert amateur is likely to know, it will be well to treat all striking clocks in the same way and either stop them for an hour and then start them again, or set them forward 11 hours. The latter course is recommended as being the easiest and least likely to interfere with their internal arrangements. But you must be careful to give them time to strike after each hour and between the quarters if necessary.

Employés' time registers and workmen's time recorders of all kinds, on the other hand, must be stopped for an hour and restarted, otherwise the typeprinting mechanism will be put out of phase with the clock.

When daylight saving was introduced in May last, it was said that electric clocks had come into their own, and it was certainly a great boon in some thousands of business establishments, factories, and institutions to be able to set on all the clocks in a few minutes by merely pressing a lever in the master clock.

But there is no such automatic device in electric clocks for setting the clocks back, and the controlling pendulum* should be stopped for an hour and then set going again. Of course, on board ocean liners, where the clocks are changed daily, "Synchronome" installations are provided with special facilities for the purpose. On turning the hands of the master clock back, the dials throughout the ship are short-circuited and have to wait until the hands of the master clock have reached the place from which they were moved, automatically switching in the others again. It has never been suggested that daylight saving justifies this device being fitted to ordinary installations; however, it is no small advantage to be able to stop and start large groups of electrical impulse dials by dealing with their master clocks, and the Synchronome Co. will set 5,000 to time by this means in London alone. To sum up:—

Watches	Set the hands back.
Non-striking clocks ...	Set the hands back.
Striking clocks	Set forward 11 hours and allow plenty of time for them to strike.
Employés' time recorders	Stop for an hour and restart.
Electric clocks	Stop for an hour and restart.

The Changed Outlook of Labour.—Mr. Stephen Walsh, M.P., chairman of the Works Section of the English Conciliation Board, speaking at Wigan, on Saturday, said that our own people had often been set aside while positions of trust and responsibility had been given to Germans; but wherever the Germans went they had not merely been carrying on their freedom of trade; they had at the same time been carrying on an accursed system of spying in our midst, which had almost led to the undoing of the nation. British fairplay was proverbial all the world over, and we had carried it to such a degree under the guise of trade that there had been traitors in our midst who had almost destroyed the kingdom and all that it stood for. After the horrible facts which the last two years had given us, surely it was the lesson of common sense, not to speak of high statesmanship, to develop our own resources in our own land. Why should we always make ourselves the dustheap and the dunghill of the whole world? There was a thousand and one things which we could just as well produce in our own land, or in the Dominions affiliated with us, instead of being dependent upon the foreigner.—*Morning Post.*

Liverpol Electrical Dispute.—A long drawn out dispute between the Liverpool Master Builders' Association and the Liverpool branch of the Electrical Trade Union seems at last to be on the way to settlement. The friction arose out of a demand on the part of the men for increased wages, reduced hours, and various minor concessions. Arbitration was at length agreed upon between the parties, and the Rev. H. Bunnico is acting as arbitrator, his decision to be final. He is now in Liverpool taking evidence with the object of ending the deadlock.—*Liverpool Post.*

A Lamp-Filament Breaker.—A device for breaking the filaments of incandescent lamps which are returned into its supply department, has been constructed by the Boston Edison Co., and is in regular use in the local lamp division. Among the thousands of incandescent lamps returned as having been burned out by customers are many which, though not entirely useless, are, nevertheless, unfit for further service. To prevent purchasers from sorting the lamps and reselling those with filaments intact, a means of breaking the filaments of lamps of sizes up to 250-watt tungsten was sought. As a result, an apparatus was constructed consisting of a laminated U-shaped electromagnet with a gap sufficiently wide to admit a large-sized lamp between its jaws. A quick-acting lamp socket is arranged between the jaws of the U and is supplied, in series with a resistance, from a 220-volt A.C. circuit. In addition to this fixed resistance, another can be switched-in in parallel. When a lamp is pushed into the socket the effect is to break the filament instantly. The resistance in series with the lamp prevents short-circuiting on the 220-volt main in case of an occasional defective base. If, as sometimes happens with very large tungstens, the filament breaks and welds near the leading-in wires, the second resistance is thrown in, thus allowing more current to flow, and invariably breaking the filament. The direct-current field is left on continuously while operating. With this apparatus filaments are broken as rapidly as the lamps are inserted in the socket and placed to one side, and the lamp is in no way injured, nor is the blackening of the bulb increased.

Steel Conductors for House Wiring.—Judging by an editorial in the *Electrical Review and Western Electrician*, the use of iron and steel wires for house-wiring, which originated in Germany under the stress of circumstances, is attracting attention in the United States. As we pointed out in our issue of June 30th, there is a great deal to be said in favour of this practice, in view of the small currents required nowadays for domestic lighting circuits. Our American contemporary suggests that the use of iron wire may prove to be a much more satisfactory means of reducing the cost of wiring than the concentric system, which was recently taken up in the United States with great enthusiasm, but appears to have given very disappointing results as regards economy. We hope that the Wiring Rules Committee of the I.E.E. will take the subject into consideration, as it is a matter of no little importance to our own electrical industries.

American Glass for Lamp Bulbs.—The glass used in making electric light bulbs is a very special kind of glass that must withstand sudden changes in temperature and also great pressure. Heretofore it has been thought that only glass made with a certain amount of potash was suitable.

The outbreak of the war cut off the supply of potash from Germany. However, recently the research chemists of the General Electric Co. have succeeded in producing a glass for making electric light bulbs by replacing potash with soda in the glass mixture. This glass has proved greatly superior to the old potash glass; so much so, that potash glass will no longer be used.—*Canadian Engineer.*

Applications for Provisional Orders.—The Board of Trade has addressed the following letter to the Parliamentary Agents' Society:—

I am directed by the Board of Trade to state that they have under consideration your letter of September 8th, submitting on behalf of the Society of Parliamentary Agents certain representations for a modification of the notice issued by the Board last year to the effect that applications for Provisional Orders would not be entertained except in cases when extreme urgency existed.

The Board realise that the position has altered since the issue of the notice in question, particularly in the direction indicated in the circular letter issued by the Local Government Board on August 28th last, and in these circumstances the Board of Trade will be prepared to entertain applications for Provisional Orders in the ensuing session when it can be shown that the establishment of works under the schemes proposed will be proceeded with as soon as practicable after the termination of the war.

In determining whether an application shall be allowed to proceed, the Board will have particular regard to the considerations as to how far the exercise of the powers will provide an outlet for labour or for the utilisation of plant and machinery which have been provided for the purposes of the war.

The Board will be prepared to consider proposals before any expenditure is incurred in respect of the publication of notices, &c., and to intimate whether, in their view, a *prima facie* case has been made out for the promotion of the application subject to consideration of objections.

The Board are, however, of opinion that it is undesirable that proposals shall be put forward which are likely to provoke serious opposition, or to prove unduly costly to promote.

I am to add that the policy of the Board in dealing with these applications may be subject to further modification in the event of a change in the general situation due to the war.

I am, Sir,
Your obedient Servant,
C. Hipwood.

Fatality.—The *Times* states that a Belfast electrician, named Gerald J. MacErleane, was killed at the Inver Bleach Works, Larne, on Saturday, owing to his clothes becoming entangled in the machinery.

Electro-Harmonic Society.—The first smoking concert of the season will be held at the Holborn Restaurant (King's Hall), on Friday, October 13th, at 8 p.m. The other events in the programme for the season are as follows:—

Ladies' Night	Monday, November 20th.
Smoking Concert ...	Friday, December 15th.
Smoking Concert ...	Friday, January 5th.
Ladies' Night	Monday, February 12th.
Smoking Concert ...	Friday, March 16th.

Educational Notes.—University of London, University College.—Prof. J. A. Fleming, F.R.S., will deliver a public lecture on "Long-distance Telegraphy and Telephony," on Wednesday, October 18th, at 5.30 p.m., and a course of six lectures on "Long-distance Telephony," on Fridays at 5 p.m., beginning October 27th, 1916. The public lecture is open without fee or ticket. The course is open to non-members of the University; application for tickets of admission to it should be made to the Secretary.

The Polytechnic School of Electricity, Regent Street, W.—The evening classes in electricity, electrical engineering and physics commence on Monday next, under the charge of Mr. W. Hibbert, A.M.I.E.E.

The Restriction of Output.—The Sheffield correspondent of the *Engineer* writes as follows on this important subject:—"The question of munitions output is often discussed in a way that would lead one to suppose that the idea of restriction was dead and buried. I was speaking with a director this week regarding prospects for Sheffield trade after the war. He knows the situation in and out and through and through. His opinion was that everything depended upon the attitude of the men. The best men amongst trade union leaders, he believes, are quite to be depended upon to advise the workers wisely, but there is the other element to take into consideration, which poisons the minds of many of the workers, with the result that output is seriously restricted. 'You must remember,' he added, 'that after the war, output is going to be the great question. The German workmen earned, before the war, less than our men, worked longer hours, and turned out more per man.' There is, of course, no suggestion of lower wages in this country to meet the difficulty, but the output will have to be quickened. The war has speeded things up, but few realise how much latent energy there still remains if certain men would only utilise it. They could do it without injuring their health in the slightest or shortening their lives by an hour. The director with whom I was speaking is of opinion that trade unionists everywhere will have to recognise the truth that a man must be free to turn out as much as he reasonably can in a given time, and that his earnings must be according to his merits. The policy of measuring the work of a man by the ability of the slowest is one that has been holding us back industrially, and therefore commercially. In future a man must be at liberty to put in his best work, and employers must place no restriction upon the earning possibilities of such a man. That will be the sort of profit-sharing that will not only appeal to the men themselves, but will bring out the best men and multiply the output. The other day I had an opportunity of chatting with a munition worker, who had seen things that amazed him. A short time ago he was a tradesman; now he knows far more about shells than do many men who have worked among them all their days. 'It is not,' he said, 'so much what the trade unions tell the men to do, as what some of the trade unionists agree amongst themselves to do. For instance, there was a certain part of a shell which these men declared they could only make at the rate of 15 a night shift. Well, you could go to sleep half the night and do 15 easily. A proof of what I say is that just recently a youth—he was not much more—made 65 during a night shift, and felt none the worse for it. Take another operation in shell making. The trade unionists said they could only do a dozen a day, but a youth the other day did 30 without any particular exertion, whilst anybody could do 20 in the time.' It is not in that spirit that wage possibilities will be increased after the war. If the workers do not co-operate with the employers about the enterprise of the latter in entering new markets abroad, whether they be Russian or any other, their efforts will be futile. The interest of the employer is the interest of the worker, and where that is not so, trade union leaders may quite be trusted to present the case of the men."

Volunteer Notes.—First London Engineer Volunteers.—Headquarters, Chester House, Eccleston Place, S.W.—Orders for the week by Lieut.-Col. C. B. Clay, V.D., Commanding.

Monday, October 2nd.—Technical for Platoon No. 9, at Regency Street. Squad and Platoon Drill, Platoon No. 10. Signalling Class. Recruits' Drill, 6.25—8.

Tuesday, October 3rd.—School of Arms, 6—7. Lecture, 7.15. "Development of the Soldierly Spirit." The Adjutant. Range Practice.

Wednesday, October 4th.—Instruction Class, 5.45. Platoon Drill, Platoon No. 3. Range Practice.

Thursday, October 5th.—Platoon Drill, Platoons Nos. 5 and 6. Range Practice.

Friday, October 6th.—Technical for Platoon No. 10, Regency Street. Squad and Platoon Drill, No. 9. Signalling Class. Recruits' Drill, 6.25—8.25.

Saturday, October 7th.—N.C.O.'s Class, under Company Commander W. D. Bentley, 2.30.

Sunday, October 8th.—Entrenching.—Parade Victoria Station (S.E. & C. Railway). Booking-office, 8.45 a.m.

Note.—Members who have not yet obtained their Cards of Membership should apply to the Adjutant on Tuesdays or Thursdays.

Macleod Yearsley, *Adjutant.*

Institution and Lecture Notes.—Iron and Steel Institute.—At the autumn meeting of the Institute, Sir William Beardmore, chairman, stated that it was proposed by the Council to form Committees to report on new developments in the iron and steel industry, and that a Research Committee should be appointed to make suggestions and give advice. It was hoped by these means to encourage a greater interest in the affairs of the Institute. The Council announced that the Privy Council had sanctioned the new by-law providing for the expulsion from the Institute of members who were subjects of a country at war with the United Kingdom.

Institute of Metals.—At the autumn meeting, last week, Sir G. T. Beilby was re-elected president of the Institute.

The Faraday Society.—The Society will hold a general discussion on "Refractories" at its first autumn meeting, the date of which is provisionally fixed for Wednesday, November 8th, 1916. The discussion will be presided over by Sir Robert Hadfield, F.R.S., President of the Society, and the opening paper will be read by Dr. J. W. Mellor, of Stoke-on-Trent. Suggestions are invited from those specially interested in the subject as to any particular aspects which they would like ventilated or discussed, and those who are desirous of contributing to the discussion, or who wish to show any exhibit at the meeting, are invited to communicate with Mr. F. S. Spiers, Secretary of the Faraday Society, 82, Victoria Street, Westminster, S.W.

Appointments Vacant.—Shift engineers for the St. James and Pall Mall Electric Light Co., the Malden U.D.C., and the Scottish Central Electric Power Co., Ltd.; borough electrical engineer and manager for Wigan (£400). See our advertisement pages to-day.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—Mr. A. C. CRAMB, borough electrical engineer, reported to Croydon Borough Council on Monday that the main part of his work as honorary district manager of the Croydon area of the Metropolitan Munitions Committee had now been completed. Part of a letter received by Mr. Cramb from the Committee ran as follows:—

> Your willingness at all times to give effect to the wishes of the Board (of Management), and the thoroughness with which the work of your district has been carried out, has been highly appreciated by them, and has considerably assisted them in carrying out their important functions. The Board also wish to thank you for your kind promise to render them assistance at any time in the future.

In a further letter to the Council, the Committee expressed gratitude for Mr. Cramb's untiring efforts and whole-hearted devotion to the work.

Thirty-one applications were received for the appointment of tramway manager at West Ham in place of Mr. Moffet, resigned, and seven candidates were interviewed. Mr. M. L. SLATTERY, traffic manager, L.C.C. Tramways, for the past 5½ years, and previously at Oldham, Blackpool, Blackburn, and other places has received the appointment.

General.—*London Gazette* Notice.— Territorial Force, Royal Engineers. Tyne Electrical Engineers: Sergeant RICHARD OWEN PORTER, from Devon Fortress R.E., to be Second Lieutenant (on probation).

After 14 years' service in the electrical branch of the chief engineer's department of the London County Council, Mr. H. G. HOAD is resigning to take up an important position with Messrs. W. C. Tackley & Co., Ltd., electrical and mechanical engineers, of 28, Blythe Road, Kensington, W. Since he entered the Council's service in 1902, Mr. Hoad has carried out a very large number of electrical installations at the various offices, schools, institutes, museums, lodging-houses, &c.

Roll of Honour.—The following is a list of men from Simplex Conduits, Ltd., who have been killed in the war:—

Betts, A., Worcester Regiment (brass shop), France.
Bodfish, H., Warwickshire Regiment (foundry), France.
Ireland, J., Warwickshire Regiment (enamelling shop), France.
Mousley, E. A., R.A.M.C. (stores office), Egypt (died of wounds).
Parker, G., Warwickshire Regiment (fittings shop), France.
Robbins, S., Worcester Regiment (fuse department), France.
Swarsbrick, D. H., Warwickshire Regiment (purchasing department), France (Somme).
Fowkes, P. F., Royal Engineers (Manchester office) (died training at home).
Lock, W. A., R.F.A. (general office), France.
Liddiard, B., Warwickshire Regiment (general office), France (Somme).

The following have been wounded:—

Bill, N., Warwickshire Regiment (heating department), France.
Birtley, A., Warwickshire Regiment (purchasing department), France.
Boulton, C., Wiltshire Regiment (general office), France (Loos).
Baird, G., Scottish Horse (Glasgow office), Gallipoli.
Cain, J., Warwickshire Regiment (foundry), France.
Quinney, J., R.F.A. (fuse department), France.
Raison, F., Lancashire Fusiliers (forwarding department), France.
Gough, M., R.G.A. (foundry), France.
Aldrich, Warwickshire Regiment (foundry), Gallipoli.
Howell, W., Middlesex Regiment (foundry), France.
Wooland, R., Warwickshire Regiment (forwarding department), France.

Lieutenant W. H. STUART GARNETT, who was killed at a flying school last week, was, according to the *Times*, the second son of Dr. William Garnett, and brother of the principal of the Manchester School of Technology. He was 34 years of age, and for a time was a practical engineer, and "brought out a remarkable text-book on the turbine."

Sapper JOHN BRUNTON, R.E., 21 years of age, who was at an electricity works at Grangemouth before the war, has died from wounds.

Second-Lieutenant D. K. COOPER, Northamptonshire Regiment, reported missing, aged 22, was an electrical engineer with the Portsmouth Corporation.

Rifleman NORMAN BROCKLEY, King's Royal Rifles, reported wounded, was employed by Messrs. Catons, electrical engineers, Oldham.

Private RICHARD MITCHELL, North Staffordshire Regiment, who has fallen in action, enlisted whilst on the staff of the Hanley Corporation electricity works.

Corporal J. H. RICHARDS, Royal Warwickshire Regiment, who has been wounded, is an electrical engineer, and was formerly on the Torquay Corporation electricity works staff. He was recently awarded the Military Medal for gallant conduct.

Private W. FOTHERGILL, Royal Warwickshire Regiment, formerly with Messrs. Willans & Robinson, Ltd., of Rugby, has fallen in action.

Corporal FRANK THIRTLEWOOD, Oxford and Bucks. Light Infantry, killed in action, enlisted in September, 1915, whilst in the cost statistics department of the British Thomson-Houston Co., Ltd., Rugby.

Private NEWELL, Royal Fusiliers, who is reported killed in action, after being missing since August 7th, last, enlisted early in the present year. He was formerly in the drawing office of the British Thomson-Houston Co., Ltd., Rugby.

Private JOSEPH NUTH, R.A.M.C., who has died from dysentery at Salonica, was formerly engaged at the Corporation electricity works at Tunbridge Wells. Before going to Salonica he served at the Dardanelles and in Egypt.

Sergeant J. D. SUTTON and Sergeant A. J. L. MOORE, Oxford and Bucks Light Infantry, both of whom were on the staff of the British Thomson-Houston Co., Ltd., Rugby, have been wounded.

The Norwich Electricity Committee reports that Mr. A. J. RANDALL, for many years employed in the electricity department, has recently been awarded the Military Medal for conspicuous bravery in laying and repairing telephone cables under heavy shell and rifle fire, and was decorated by the General Commanding before the whole Brigade. The Council is recording on its minutes its appreciation of Mr. Randall's action and of the honour accorded to him, and the Mayor is conveying to Mr. Randall an expression of the Council's appreciation.

Private HARRY HUGHES and Corporal JOSEPH GORDON, both of the Lancashire Fusiliers, and formerly in the employ of the Lancashire Electric Power Co., have been killed.

Bombardier J. PAILS, of the R.F.A., formerly employed by Messrs. Dick, Kerr & Co., Ltd., Preston, has been wounded.

Private E. PEARCE, of the King's (Liverpool) Regiment, reported wounded and in a convalescent camp in France, was formerly engaged as an electrical engineer at Blackpool.

Staff-Sergeant HOWARD BRAMALL, formerly employed at the British Westinghouse Works, Trafford Park, has been awarded the Military Medal.

Obituary.—SIR GEORGE FRANKLIN.—We regret to record the death, which occurred suddenly on Saturday last, at the age of 63 years, of Sir George Franklin, of Sheffield and London, who was chairman of the National Telephone Co., Ltd., in the period immediately preceding the transfer of the telephone system to the Post Office. We gather from one of the financial dailies that Sir George joined the board of the National Co. in 1892, after having arranged the acquisition of the telephone business of the Sheffield Telephone Exchange and Electric Light Co., which Messrs. Taskers initiated in Sheffield. The electric light system was taken over by the municipality, and the telephone exchange was eventually absorbed by the National Telephone Co., when Sir George joined the board. On the death of Mr. Gaine he assumed also the office of general manager, a dual position, which was probably only rendered possible by the able assistance given by the engineer-in-chief and the general superintendent. As president of the company, Sir George acquired from the start the confidence of the shareholders, and was especially successful in his conduct of the annual meetings, his statements being invariably clear, practical, and businesslike. He became president in 1906 in succession to Sir Henry Fowler, and occupied that position until the undertaking was taken over by the State on January 1st, 1912. Sir George was president of the Constantinople Telephone Co., chairman of the Telephone Development Co., and of the United River Plate Telephone Co., and a director of the British Thomson-Houston Co.

MR. RICHARD PRICE WILLIAMS.—The *Times*, in recording the death of Mr. Richard Price Williams, an old railway engineer, says that when the telegraphs were taken over by the State in 1871 the railways successfully contended that their property in the telegraphs and wayleaves should also be purchased under the "Gladstone" purchase clause of the Regulation of Railways Act, 1844, and Mr. Williams was entrusted with the preparation of most of the claims, the satisfaction of which cost the Government some £3,000,000.

MR. T. A. BELL.—The death occurred on Thursday last week, suddenly, of Mr. T. A. Bell, electrical engineer, Bradford. Mr. Bell, who was 48 years of age, carried on, in conjunction with his brother, Mr. L. A. Bell, the business of Charles Bell, electrical and hydraulic engineers, of Joseph Street, Bradford.

MR. GORDON DAVIES.—The death has taken place, suddenly, of Mr. Wm. Gordon Davies, traffic manager of the Chatham and District Light Railways Co. He was 69 years of age.

NEW COMPANIES REGISTERED.

McLeod & Sons, Ltd. (144,891).—This company was registered on September 20th, with a capital of £2,000 in £1 shares, to take over the business of manufacturers of ships' telegraphs and nautical instruments, marine, mechanical, electrical, and general engineers, and compass adjusters carried on by J. Y. McLeod and T. W. McLeod as McLeod & Sons at 15, Cheapside, Liverpool. The subscribers (with one share each) are: J. Y. McLeod, 15, Cheapside, Liverpool, nautical instrument maker; T. W. McLeod, 15, Cheapside, Liverpool, nautical instrument maker; A. W. Jones, 41 Castle Street, Liverpool, accountant. Private company. The number of directors is not to be less than two or more than five; the first are J. Y. McLeod (managing director) and T. W. McLeod. Registered office: 41, Castle Street, Liverpool.

Selson Engineering Co. (Italy), Ltd. (144,892).—This company was registered on September 20th, with a capital of £3,000 in £1 shares, to carry on the business of mechanical, electrical, and general engineers, manufacturers of and dealers in machines and hand tools, appliances, implements and instruments, machinists, founders, motor and engine builders, &c. The subscribers (with one share each) are: H. F. Henshaw, 85, Queen Victoria Street, E.C., engineer; F. M. Selson, 85, Queen Victoria Street, E.C., engineer. Private company. Table "A" mainly applies. Solicitors: Stephenson, Harwood & Co., 31, Lombard Street, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Evershed & Vignoles, Ltd. (432,062).—Capital, £30,000 in £10 shares. Return dated July 13th, 1916. All shares taken up; £30,000 paid. Mortgages and charges: £15,000.

Walters Electrical Manufacturing Co., Ltd.—A memorandum of satisfaction in full on various dates of debentures dated July 31st, 1907, securing £2,000, has been filed.

Duroglass, Ltd.—Issue on September 12th, 1916, of £1,200 debentures, part of a series of which particulars have already been filed.

Gorseinon Electric Light Co., Ltd. (39,944).—Capital, £10,000 in £1 shares. Return dated April 17th, 1916. 9,350 shares taken up; £9,348 paid, leaving £2 in arrears. Mortgages and charges: £780.

International Dowsing Electric Heating & Appliances Co., Ltd. (83,693).—Capital, £20,000 in £1 shares. Return dated December 31st, 1915 (filed August 31st, 1916). 18,107 shares taken up; seven shares issued for cash; £18,100 considered as paid. Mortgages and charges: Nil.

CITY NOTES.

Victoria Falls and Transvaal Power Co., Ltd.

The annual meeting was held last Friday at Salisbury House, E.C., Mr. A. E. Hadley, the managing director, presiding. The chairman said they were to be congratulated on the very satisfactory results obtained during the year, and on their improved financial position. Those results had been obtained through the company having brought into commission the further plant which was in course of construction during the previous year, and also through the economies effected in the operation and working of the plant by the staff in South Africa. He was able to report a continuance of this progress during the current year, the earnings of the combined undertakings for the eight months ending August 31st last showing the substantial increase of over £70,000 over the corresponding period last year. Proceeding to deal with the balance sheet, the chairman said that the combined share and debenture capital stood at £7,465,620. The first mortgage debentures remained at £3,000,000, but the second mortgage debenture capital, which stood at £1,465,620, showed a decrease on the previous year's figure, a further £78,300 of these debentures having been purchased and cancelled during the year 1915, the total amount redeemed by purchase to that date being £184,380. The creditors and credit balances amounted to £588,580. On the other side of the balance sheet the item of leases and concessions and purchase of undertakings stood at £1,526,303, as compared with £1,536,638, a decrease of £10,335, accounted for by a charge for depreciation and by certain items which had been sold or transferred to other accounts. The expenditure on and in connection with power stations, buildings, equipment, and land, stood at £2,130,015, a decrease of £8,815, accounted for by sales, amounts transferred to other accounts, and depreciation written off, less further expenditure of £73,399 in connection with extensions made to the company's stations during the year. The company's investment in the Rand Mines Power Supply Co., Ltd., figured in the balance sheet at £3,415,894, as compared with £3,492,494, the decrease of £76,600 being the amount written off, equivalent to the depreciation on that company's machinery and other property, less further advances made to that company during the year. The cash at bankers and on loan amounted to £979,040, and in addition the company held at the date of the balance sheet £100,000 of 4½ per cent. war loan, which figured in the balance sheet at £96,000. The item in previous balance sheets representing preliminary expenses had been written off. Dealing with the profit and loss account, the interest charge on debentures had decreased from £234,842 in the year 1914 to £232,556, the decrease being accounted for by the amount of debentures purchased for redemption, and this charge for interest would decrease each year proportionately to the amount of debentures redeemed. The directors had applied £274,024 towards depreciation and certain writings off, including provision for income-tax and excess profits duty, carrying forward £223,080. The year's operations had resulted in an increased profit of £61,832. In 1913 they carried to the balance sheet £128,411, in respect of 1914 £161,248, and in respect of the year under review the substantial sum of £223,080, increasing that account to £339,068. Out of the balance the directors had paid two dividends on the preference shares at the rate of 6 per cent. per annum, each dividend being for ten months, which brought the dividends on the preference shares up to December 31st, 1915, the date of the accounts. Those dividends accounted for £177,500, which left £161,568 to be carried forward. Shareholders would agree that this increase in the profits was very satisfactory, showing as it did a continuance of the prosperity of the undertaking. The directors had very carefully considered the disposal of the sum of £55,000 by which the carry-forward was increased. The accounts showed that the company had entered the stage when the earnings were more than sufficient to meet the 6 per cent. on the preference shares. The amount, admittedly, if expressed as a percentage of the share capital, was small, and did not represent 2 per cent. on the issued capital. Further, the times they were passing through and the uncertainty of all financial conditions, including that as to future taxation, made it essential to conserve as far as possible the resources of the company. Again, the board had to watch demands for power, and it was obvious that the management of this great undertaking must be conducted on lines which were reasonably conservative. Therefore in respect of the past year the board decided that it was in the best interests of the company to add this amount to the carry forward. In view of the continued increase in the earnings, the board was not unmindful of the desirability of adopting a policy of paying the dividend on the preference shares at the end of each six months as and when such dividend became due. The directors had in contemplation the payment, at the beginning of next year, of a full 12 months' dividend on the preference shares at the rate of 6 per cent. out of the profits earned during the year 1916, which would thus bring the dividend on the preference shares right up to date. Thereafter it was confidently anticipated that the preference dividend would be paid regularly, in half-yearly instalments, immediately after the due date. The prospects of the company in the near future, judged by the progress made up to the present time, were very encouraging, and, as he had already told them, there was an increase this year of £70,000 up to the end of August compared with the similar period last year, while the earnings for the year 1915 exceeded the requirements of the cumulative preference dividend and enabled the payment of these dividends to be brought up to the date of the balance sheet. In endeavouring to look into the future it must be remembered that as the profits increased the amount payable as excess profits duty, as long as that tax remained in force, increased also. So far as was known there was no reason to expect that the earnings should fall during the remainder of the year, and if this proved to be the case, and taxation was not further increased, the results of the present year should enable a start to be made in the payments of dividends on the ordinary shares, and in the establishment of a reserve fund which was so desirable in an undertaking where the supply had to be given within a reasonable time of demand. As he said last year, the heavy capital expenditure of the company had now practically terminated; but as from the end of this year provision would in future have to be made for the redemption of the first debentures by annual instalments of £165,000, which includes the premium, but as this sum would be met out of the annual charge for depreciation, and inasmuch as a similar sum, more or less, had been set aside out of the profits in previous years which had been utilised in providing the necessary funds for the extension of the company's plant now completed, this charge against profits would not be felt to any greater extent than formerly, and the only extra charge they had therefore to consider, at present at any rate, was that of the increased income-tax and excess profits duty, which latter charge would doubtless cease with the termination of the war. The extensions to the Brakpan power station had been completed, and the whole of the plant ordered for all the power stations of the combined undertakings was now installed and in working order, and this plant, which had a capacity of 274,875 H.P., should enable them to meet normal increases in business without encroaching on the specified reserve plant. Before concluding, he and his colleagues wished to register their appreciation of the untiring loyalty of the staff both in London and South Africa. As they knew, the chairman was still serving with His Majesty's Forces, as also was Major Wills, another of the directors. As regarded members of the staff serving with the Colours, they would be interested to hear that in South Africa, out of a total number of 670 employés, there were serving their country 210, or 31 per cent., either with the Colours or on work connected with the war. As regarded the London staff, nine were serving with the Colours and three were employed on munitions work.

Lord Brabourne seconded the motion.

Replying to questions, the Chairman said that the assessment of excess profits was calculated according to the provisions of the Act, which were very special, and they were not calculated on dividends actually paid. They had to bear in mind that although they had not paid an ordinary dividend they had been earning profits which had been devoted to bringing the cumulative preference dividend up to date. The report was adopted.

Manaos Tramways and Light Co., Ltd.

Mr. George Watson, presiding at the annual meeting, held in London on September 15th, said that the report showed some improvement, the total receipts having increased by £104, while the total expenses fell by £8,068. The debentures had been further reduced by £2,900, leaving a balance of £291,000, in addition to which there were issued £50,000 debentures as collateral security against the loan outstanding.

The very substantial reduction in working expenses had been obtained by a rearrangement of the services given to the public; by the adoption of wood fuel; and by keeping a very strict watch upon all expenditure, but the physical condition of the property and the efficiency of the service had in no way suffered from the economies which had been effected. In fact, rather more money was spent last year on the upkeep of the track, car bodies, and trucks than during the previous year. They were still continuing to use local wood for fuel, and during the year had used practically nothing else. The price of coal delivered in Manaos was now about three times as much as before the war, and the coal bill in normal times used to amount to over 15 per cent. of the whole operating expenses. The serious effect of the change would therefore be readily seen, and instead of a large increase in the generating cost per unit they found that the unit of electricity cost exactly the same as it did in normal times. The most serious item of the profit and loss account was the loss on exchange, which this year amounted to £13,093, as against £6,180. The average rate at which they brought money from Manaos during 1914-15 was 13¼d., as against nearly 16d. for the previous year. The result for the past year had been substantially more unfavourable. The conditions in Brazil, although improving in many ways, did not reach a point at which exchange might be favourably effected. The scarcity of commercial bills, the increase in the issue of paper, and the small amount of imports seriously affecting the revenues of the country, all tended to keep down the sterling value of the milreis. His reasons expressed a year ago for expecting exchange to remain comparatively steady still held good, and while the present arrangement for funding the Brazilian debt continued he considered that exchange should remain steady. The balance of trade continued to be in favour of the Republic, and the Government had displayed during the last year, and were still displaying, a very gratifying tendency to avoid waste in national expenditure. He had recently seen in the newspapers that that tendency was not confined to national expenditure, but that even officials had agreed to accept a lower remuneration during the present crisis. Since the end of the fiscal year a marked improvement had taken place in exchange, and the average rate for the last four months had been about 12¼d. The chairman referred to the company's claim against the State Government for public lighting, and the effect of the rubber industry upon the company's affairs.

French Electrical Companies.

The Compagnie Electro-Mecanique records net profits totalling £21,000 for 1915, as compared with £25,000 in the previous 12 months, and £20,000 of the former has been distributed among the shareholders.

The accounts of the *Société d'Electro-Chimie* for 1915-16 show net profits amounting to £73,000, as compared with £35,000 in the preceding year. It has been decided to pay a dividend of £2 per share, as against £1 10s. in 1914-15.

The Société des Appareils Electriques Grivolas reports net profits and balance forward of £29,700 for 1915-16, as contrasted with £20,800 in the previous year, and £9,100 in 1913-14. A dividend at the rate of 5s. 7d. per share has been declared, this comparing with no distribution and 4s. per share in the two preceding years respectively.

The Maison Breguet, which has abstained from publishing accounts since the outbreak of the war, has convened a general meeting of the shareholders for October, when accounts for 1913-14, 1914-15, and 1915-16 will be submitted. It is stated that notwithstanding the enemy occupation of the company's works at Douai, large profits have been realised, as it has been possible actively to develop working at the shops in Paris. The results obtained will permit, after writing off the value (£64,000) of the buildings, plant, and materials at Douai, of the payment of a dividend of £2 per share, this contrasting with a dividend of £1 per share paid on account for 1913-14 and £1 per share for 1914-15.

Dundee, Broughty Ferry & District Tramways Co.—Mr. George Balfour, the chairman, presided at the annual meeting, when a final dividend on the preferred stock at the rate of 6 per cent. for the half-year, less income-tax, was declared. The chairman said he hoped when they met next year they would be able to record the triumph of the Allies' cause. The receipts for the year amounted to £11,825, or a decrease of £1,468 compared with the previous year. Against that decrease, however, they had a saving in expenditure, after meeting the increased cost of coal, amounting to £421, making the actual decrease a little over £1,000.

Direct West India Cable Co., Ltd.—For the year ended June, 1916, the net result of working was £14,705, as against £13,553 last year, which, with the credit to revenue account of £64,219 with which the year began, makes a total of £78,925. An interim dividend of 3 per cent., free of tax, was paid in March, also a special interim dividend of £1 5s. at the same time at which a call of £1 5s. per share was made, and a further 3 per cent., tax free, is now proposed. The balance to be carried forward is £53,399. The company's cable was interrupted between Bermuda and Turks Island for 54 days, and the insulation is still low; £7,375 has so far been paid on account of the cost of repairs; the balance has not yet been ascertained.

Halifax and Bermudas Cable Co., Ltd.—For the year ended June, 1916, the net result was a balance of £12,745, as against £10,679 for 1915. An interim dividend of 3 per cent., free of income-tax, has already been paid, and a further equal payment is now to be made. The balance to credit of revenue account, which was last year £11,549, has had to be debited with the various items recorded in the revenue account for repairs, &c., and is now £7,710. The company's cable worked efficiently during the year, except for a few days while being repaired in the Halifax Harbour.

STOCKS AND SHARES.

Tuesday Evening.

These moonless nights make men think of things far from financial, and the "Special" scribe, who writes with a price-list in one hand and the hope of Zeppelin prisoners in the other, strains both ears the while, as he confuses fog signals with anti-aircraft guns, and the roar of the passing motor 'bus with the propeller of nocturnal raiders. The Stock Exchange markets find business themes less exciting than experiences of the Zepp. nights, and the all-absorbing desire is to have front seats for the next spectacle of a maurauder descending in flames.

Nevertheless, business goes on steadily all the same. Some Stock Exchange firms find their hands full. The Treasury Scheme "B," the depletion of staffs, the rubber boomlet—all play their parts in providing members with work. The Home Railway crisis is settled once more, the men receiving twice the previous war bonus, and this time the Underground Electric Railways of London has fallen into line with the State-controlled steam companies. For a few hours the Railway market assumed a better complexion, but the recovery did not last for long enough to attract any public buying, and prices are still very dull. The £10 shares of the Underground Electric are 1/16 better at 1 13/16, on vague rumours of a possible raising of fares.

London and North-Western consolidated stock has been, and still remains, about the firmest in what is called the "Heavy" market, this being due to the partial electrification of the suburban system, which is now completed. This makes an important addition to the steadily-growing list of electrified companies, and the prophet may safely vision the time in a none-too-distant future when steam services for suburban train traffic will have ceased to be. Adaptation of the current to long distances is a matter of more time.

With the conclusion, for the time being, of the Daylight Saving Scheme, Electric Lighting shares have come in for further inquiry, although, as we have pointed out before, there are so few shares on offer that the present quotations are largely nominal; and business accordingly is quiet. London Electric preference are again better on the week; their rise to 4 9/16 represents the only change in the list since we last wrote. The manufacturing shares are good; British Aluminium ordinary have risen 1s. 9d. to 28s. on the declaration of an increased dividend. General Electric ordinary continue their improvement, rising 5s. to 14¾. Westinghouse preference hold their rise of last week, and Callenders are a good market at 12¾.

Various telegraph dividends have appeared during the last day or two. The Direct Spanish announces an interim of 2 per cent., which is the regular rate; it is thought, however, that there will be an increase in the final dividend or bonus, and the price of the shares has risen a little to 5¼. The 10 per cent. preference are 7½. The Direct West India Cable Co. has done less well, the net profit of £7,300 (allowing for maintenance and repairs) being £3,700 below that for the previous year; the reason for this is that there was a breakdown in the cable between Bermuda and Turk's Island, which took nearly two months to repair, and cost the company £7,400. The Direct West India Co., however, has a substantial carry-forward, and the dividend is maintained at 6 per cent. A bonus of £1 5s. per share has been declared, and a call of the same amount made. The Halifax and Bermudas Cable Co. made £700, also allowing for maintenance and repairs, against £3,100 in 1913, the decline in this case also being due to exceptional cable repairs; the dividend, however, is maintained at 6 per cent.

Oriental Telephones are better at 2 5/16. There are no changes in the Eastern group. Marconis lost 1/16. A few fluctuations in Canadians and Americans have left the prices at 19s. and 11s. respectively. Chadburn's (Ship) Telegraph Co. announces a net profit of £9,800, being an increase of £2,500, after raising the depreciation by £2,000 and setting aside an additional £6,000 as compared with last year, for income and excess profits tax. The company has declared a dividend on its ordinary shares at 8 per cent. Of course, in cases where companies are making these big reserves against excess profits tax, if it should turn out to be that the sums are over-generous, the shareholders will reap the benefit in the course of a year or two after the declaration of peace.

Victoria Falls & Power ordinary shares have been an active market between 10s. 6d. and 11s., and the preference rose to 21s. 9d. Some attention has been paid to the 5½ per cent. second debentures, a little stock of the last-named having come to market at 102¼. At this price the bonds look cheap,

because the security is ample, the interest payments are made free of tax, redemption is at 103 or by purchase in the market, and the yield on the money (taking income-tax at 5s. in the £) works out to the equivalent of rather over 7 per cent. Coupons are payable on January 1st and July 1st, so that at the present time there is three months' interest included in the price.

There is no stopping the rise in British Columbia Electric Railway issues. This week the deferred has put on four points, the preferred three, the 4½ debenture stock two, and the preference one. Some of the buying is reported to be on account of New York, where, by the way, the Stock Exchange is having the time of its life, and brokers are busier than most of them have ever been before. When a single motor company in America can make over 60 million dollars profit in one year, and when the shares of a munition-making company rise from 25 to 710, no further evidence need be cited of the abnormal conditions prevailing on the other side of the pond.

Mexican affairs are drifting towards the melting-pot, and the latest news is far from happy. Some of Villa's followers are reported to have risen against Carranza; and Villa is giving further testimony to his ability to make things extremely uncomfortable for the latest President. There are no changes in the prices of the Mexican utilities. Canadians, on the other hand, are very firm, and these, with the shares in the utility companies of the States, steadily improve.

Armaments are better, and certain of the Copper group have hardened. The rubber market is active and buoyant. Business is on an animated scale, and although the price of the raw stuff supplies scanty encouragement to enthusiasm, there is no mistaking the eagerness of the speculative investor to buy good shares.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1914.	Dividend 1915.	Price Sept. 26, 1916.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	10	6⅞	—	£7 11 0
Charing Cross Ordinary	5	5	3 5/16	—	7 1 4
do. do. do. 4½ Pref.	4½	4½	3 9/16	—	6 6 4
Chelsea	5	4	8xd	—	6 13 4
City of London	9	8	12½	—	6 10 8
do. do. 6 per cent. Pref.	6	6	10⅜	—	5 15 8
County of London	7	7	10 3/16	—	6 9 8
do. 6 per cent. Pref.	6	6	10⅜	—	5 15 8
Kensington Ordinary	9	7	6⅝	—	6 4 5
London Electric	4	3	1⅝	—	6 10 5
do. do. 6 per cent. Pref.	6	6	4 5/16	+ 1/16	6 11 4
Metropolitan	3½	3	2¼	—	5 9 1
do. 4½ per cent. Pref.	4½	4½	3⅛	—	7 4 0
St. James' and Pall Mall	10	8	6⅝	—	6 5 6
South London	5	5	3 13/16	—	6 16 1
South Metropolitan Pref.	7	7	1 3/32	—	6 7 3
Westminster Ordinary	9	7	6½	—	5 12 0
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	102	—	5 17 6
do. Def.	30/-	33/6	23½	—	7 8 9
Chile Telephone	8	8	7	—	5 14 5
Cuba Sub. Ord.	5	5	8⅛	—	6 8 6
Eastern Extension	7	8	14⅝	—	*5 9 6
Eastern Tel. Ord.	7	8	14 5/8	—	*5 10 0
Globe Tel. and T. Ord.	6	7	12¼	—	*5 8 8
do. Pref.	6	6	10⅞	—	5 10 4
Great Northern Tel.	22	22	42	—	5 4 9
Indo-European	13	13	49	—	6 12 8
Marconi	10	10	3⅛	— 1/16	3 4 0
New York Tel. 4½	4½	4½	100	—	4 10 0
Oriental Telephone Ord.	10	10	2 5/16	+ 1/16	4 6 6
United R. Plate Tel.	8	8	6⅜	— ⅛	*5 18 5
West India and Pan.	1	—	1 1/16	—	—
Western Telegraph	7	8	14⅜	—	*5 8 6
Home Rails.					
Central London, Ord. Assented	4	4	78	—	5 9 7
Metropolitan	1½	1	24⅜	—	4 0 10
do. District	Nil	Nil	18	—	Nil
Underground Electric Ordinary	Nil	Nil	1 1/16	+ 1/16	Nil
do. do. "A"	Nil	Nil	6/-	—	Nil
do. do. Income	6	6	89½	—	*6 14 1
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4 15/16	—	6 1 6
Anglo-Arg. Trams, First Pref.	5½	5½	8½	—	7 17 2
do. 2nd Pref.	5½	5½	8	—	—
do. 5 Deb.	5	5	75	—	6 13 4
Brazil Tractions	4	4	60⅜	—	6 11 8
Bombay Electric Pref.	6	6	10½	—	5 14 3
British Columbia Elec. Rly. Pfce.	5	5	75	+1	6 13 4
do. do. Preferred	—	Nil	60	+8	Nil
do. do. Deferred	—	Nil	59	+4	Nil
do. do. Deb.	4½	4½	67	+2	6 10 9
Mexico Trams 5 per cent. Bonds	—	Nil	43	—1	Nil
do. 6 per cent. Bonds	—	Nil	86	—1	Nil
Mexican Light Common	Nil	Nil	19	—	Nil
do. Pref.	Nil	Nil	85	—	Nil
do. 1st Bonds	Nil	Nil	45	—	—
Manufacturing Companies.					
Babcock & Wilcox	14	15	3 1/16	—	4 18 0
British Aluminium Ord.	5	7	28/-	+1/9	5 14 4
British Insulated Ord.	15	17½	12¼	—	7 0 0
British Westinghouse Pref.	7½	7½	2 3/16	+1/9	5 17 0
Callenders	15	20	12⅜	+ ½	8 0 0
do. 5 Pref.	5	5	4½	—	5 17 8
Castner-Kellner	20	—	8⅜	—	5 6 8
Edison & Swan, £3 paid	Nil	—	10/-	—	Nil
do. do. fully paid	Nil	—	1½	—	Nil
do. do. 5 per cent. Deb.	5	5	62½	—	8 0 0
Electric Construction	6	7½	17/6	—	8 11 6
Gen. Elec. Pref.	6	6	10	—	6 0 0
do. Ord.	10	10	14½	+ ½	6 15 7
Henley	20	25	16½	—	7 9 2
do. 4½ Pref.	4½	4½	4½	—	5 6 0
India-Rubber	10	10	12	—	*3 3 4
Telegraph Con.	20	20	89	—	*5 4 0

* Dividends paid free of income-tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, September 27th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic per lb.	1/8	..
a Ammoniac Sal per ton	£75	..
a Ammonia, Muriate (large crystal) "	£54	..
a Bisulphide of Carbon "	£23	..
a Borax "	£34	..
a Copper Sulphate "	£51	..
a Potash, Chlorate per lb.	2/6	..
a " Perchlorate "	2/-	..
a Shellac per cwt.	128/-	..
a Sulphate of Magnesia per ton	£18	..
a Sulphur, Sublimed Flowers "	£17	£1 inc.
a " Lump "	£14 10	£1 inc.
a Soda, Chlorate per lb.	1/-	1d. dec.
a " Crystals per ton	120/-	..
a Sodium Bichromate, casks per lb.	..	..
METALS, &c.		
c Brass (rolled metal 2" to 12" basis) per lb.	1/3½ to 1/3¾	¼d. inc.
c " Tubes (solid drawn) "	1/4 to 1/4½	¼d. to 1d. inc
c " Wire, basis "	1/3½ to 1/3⅝	¼d. inc.
c Copper Tubes (solid drawn) "	1/7 to 1/7½	¼d. to 1d. inc
g " Bars (best selected) per ton	£157	£7 inc.
g " Sheet "	£157	£7 inc.
g " Rod "	£157	£7 inc.
d " (Electrolytic) Bars "	£138	£6 inc.
d " " Sheets "	£156	£6 inc.
d " " Rods "	£146	£6 inc.
d " " H.C. Wire per lb.	1/5¼	¾d. inc.
f Ebonite Rod "	3/-	..
f " Sheet "	2/6	..
n German Silver Wire "	2/8	..
h Gutta-percha, fine "	6/10	..
h India-rubber, Para fine "	3/3	½d. dec.
i Iron Pig (Cleveland warrants) per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual. "	£36	..
g Lead, English Pig "	£32 5	10/- inc.
g Mercury "	£17 12 6 to £17 15	..
e Mica (in original cases) small per lb.	6d. to 8/-	..
e " " " medium "	8/6 to 6/-	..
e " " " large "	7/6 to 14/- & up.	..
d Silicium Bronze Wire per lb.	1/8¾	¼d. inc.
r Steel, Magnet, in bars per ton	£93	£10 inc.
g Tin, Block (English) "	£173 to £174	£2 inc.
n " Wire, Nos. 1 to 16 per lb.	2/10	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Kalgoorlie Electric Power & Lighting Corporation, Ltd.—The directors have declared a dividend on the preference shares at the rate of 4 per cent. per annum for the six months ending September 30th.

Calcutta Electric Supply Corporation, Ltd.—The number of units sold to consumers during the four weeks ended August 25th, 1916, amounted to 2,073,593, compared with 2,042,910 in the corresponding four weeks of 1915.

Clyde Valley Electrical Power Co.—At the half-yearly meeting, held in Glasgow last week, Mr. F. C. Gardiner said that the profit for the half-year was considered satisfactory, in view of the large increases in the price of coal and cost of labour and all material necessary for carrying on the business, and the cost of repairs, due to the heavy demands made on the company for direct and subsidiary munitions work. The contracts for supply showed an increase during the half-year of 4,403 H.P., and connections to mains an increase of 7,544 H.P. It was expected that the new power station at present under construction near Cambuslang would be in commercial operation by the end of October.

United Electric Car Co., Ltd.—At the annual meeting, on September 20th, Mr. Robert B. Barningham stated that throughout the year their works had not been employed at anything like their full capacity. The orders for cars in progress twelve months ago had all been completed and delivered, and very few orders for tramcars had been received during the year. Corporations at home were holding back their orders at the present time, and foreign trade they could hardly expect. The directors had obtained all the Government work they could get, but there was not much chance for the company to share in large profits. He had good hopes that the company would be ultimately paid for the cars they had delivered, chiefly in South America, but one could not say how the purchasers, who were chiefly in occupied territory in Belgium, would come out of it all. He was satisfied that when hostilities ceased there would be plenty of work both at home and abroad.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING AUGUST, 1916.

THE returns of electrical export and import business for August show a very considerable increase in value of the former as compared with the previous month, though the imports fell off in value by over £30,000 in the same period.

The total value of the exports was £553,957, as compared with £487,575 in July and £603,510 in June. The month's business included over £100,000 worth of submarine telegraph cable, while machinery, cable, lamp, and battery export values reached respectable totals, though telephonic exports were on a reduced scale. It will be noted that during the month the value of our exports to the Continent reached a high level.

The imports total for the month was £183,151, as compared with £213,714 in July, the general falling-off in value being, no doubt, due to the steady reduction in American electrical imports into this country. The only notable exception was in the case of lamp and lamp-part imports, which reached a higher level, totalling some £50,000 in value, beside which our lamp export business cuts a very poor figure. Holland alone sent us some £36,000 worth of lamps and parts out of her total of £38,737 worth of business, and it may be noted that she now occupies the *second* place as regards value of electrical material entering this country. Japan's efforts as an importer of electrical material into Britain resulted in £5,785 worth of business, as against £4,381 worth in July.

The re-exports for the month amounted to £14,948, or nearly £1,000 better than in the previous month.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	1,391	547	169	1,774	...	2,274	29,350	1,704	920	607	127	9,812	48,675
Netherlands, Java and Dutch Indies ...	822	9,283	1,350	34	70	50	775	...	1,289	128	4,863	432	19,096
Belgian Congo	...	...	109	...	...	...	...	...	...	...	...	...	...
France	4,288	429	1,102	217	577	172	19,876	2,757	605	470	61	1,501	32,055
Portugal	22	151	...	...	...	947	26	...	...	...	2,049	70	3,265
Spain, Canary Isles and Spanish N. Africa...	340	22	75	15	...	1,357	2,660	8	60	120	269	549	5,475
Switzerland, Italy and Austria-Hungary ...	300	477	105	...	...	...	6,041	...	...	68	622	785	8,398
Greece, Roumania, Turkey and Bulgaria ...	70	32	...	52	...	...	188	450	...	...	...	...	792
Channel Isles, Gibraltar, Malta and Cyprus...	109	55	15	165	...	139	140	...	...	...	17	287	927
U.S.A., Philippines and Cuba	849	20	265	28	...	11	310	...	158	28	31	284	1,984
Canada and Newfoundland	370	...	...	961	...	252	4,200	...	104	...	...	566	6,453
British West Indies and British Guiana ...	223	36	31	204	...	...	155	...	93	...	74	118	934
Mexico and Central America	20	405	...	...	...	...	553	...	...	...	...	31	1,009
Peru and Uruguay	86	362	80	77	...	557	55	...	68	...	...	379	1,664
Chile	318	187	62	170	...	684	908	...	30	47	2,348	35	4,789
Brazil	588	934	47	612	...	1,121	1,796	555	933	33	144	968	7,731
Argentina	498	10,875	201	1,085	...	714	2,514	78	4,379	153	1,042	4,010	25,549
Colombia, Venezuela, Ecuador and Bolivia...	...	270	...	...	...	10	672	...	...	42	...	...	994
Egypt, Tunis and Morocco	151	902	58	674	42	232	691	114	2,061	83	31	417	5,456
British West Africa	24	478	8	219	...	...	196	...	46	...	...	96	1,067
Rhodesia, O.R.C. and Transvaal	1,787	2,620	974	2,805	...	456	1,048	292	1,026	261	379	64	11,712
Cape of Good Hope	768	6,052	506	503	40	200	1,139	...	716	21	115	10,039	20,099
Natal	783	7,187	428	695	...	...	5,974	732	1,087	43	87	9,755	26,771
Zanzibar, Brit. E. Africa, Mauritius & Aden	200	119	40	481	...	...	392	...	13	...	251	426	1,922
Azores, Madeira and Portuguese Africa ...	95	469	43	20	...	166	26	72	...	...	17	37	945
French African Colonies and Madagascar...	...	42	13	...	...	...	20	...	...	...	44	...	119
Persia	224	...	...	...	...	...	...	...	21	...	...	...	245
China and Siam	938	5,851	1,381	1,565	...	1,430	3,029	...	585	90	84	2,530	17,483
Japan and Korea	2	...	18	...	...	36	10,179	...	486	...	2,382	94,371	107,474
India	2,627	13,963	3,152	3,158	175	2,106	21,061	4,921	7,798	136	3,932	842	63,871
Ceylon	20	161	322	382	...	...	2,344	8	169	...	256	40	3,702
Straits Settlements, Fed. Malay States and Sarawak	202	834	200	279	...	42	971	365	112	86	24	3,115	6,230
Hong Kong	145	1,857	348	231	...	1,261	1,440	...	...	24	481	77	5,864
West Australia	256	2,535	237	169	...	20	3,668	...	139	10	309	107	7,450
South Australia	123	2,529	32	71	...	63	337	43	423	...	1,129	52	4,802
Victoria	777	11,453	242	1,798	10	660	6,938	...	1,172	309	1,057	346	24,762
New South Wales	1,115	15,338	875	1,596	66	1,848	14,581	7,814	3,143	305	1,355	749	48,785
Queensland	63	401	...	191	...	193	840	...	1,205	103	313	48	3,357
Tasmania	47	...	9	171	...	...	163	...	16	...	...	20	426
New Zealand and Fiji Islands	832	5,449	1,679	2,162	...	1,880	3,624	2,382	1,209	16	1,709	574	21,516
Total, £	21,473	102,325	14,176	22,564	980	18,881	148,880	22,295	30,066	3,183	25,602	143,532	553,957

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	716	56	...	...	840	...	5,378	30	1,565	398	1,660	10,643
Holland...	1,197	709	...	28,089	8,304	...	...	39	399	...	...	38,737
France	781	8	22	455	642	630	52	160	5,938	1,507	70	10,265
Switzerland	1,025	657	246	79	...	7,522	1,853	...	216	1,464	101	13,163
Italy	414	3,927	...	...	...	...	3,672	...	...	...	...	8,013
United States	7,153	2,005	459	5,242	2,394	2,458	17,854	46,411	6,230	3,705	2,558	96,469
Japan	1,583	...	...	1,392	2,612	...	...	...	198	...	...	5,785
Total, £	12,869	7,362	727	35,257	14,792	10,610	28,809	46,640	14,546	7,074	4,389	183,075

Additional imports.—Canada, electrical machinery, £50; batteries and accumulators, £14. Channel Islands, machinery, £12.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above ...	2,082	2,203	...	2,918	15	1,724	4,354	...	70	465	1,117	14,948

TOTAL EXPORTS: £553,957 TOTAL RE-EXPORTS: £14,948 TOTAL IMPORTS: £183,151

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

THE INSTITUTION WIRING RULES.

By DONALD SMEATON MUNRO.

(*Concluded from page* 314.)

Rule No. 64, with three sub-divisions, finishes the subject of wood casing, and apparently one may adopt cheap casing of small size under floors and through walls, and generally act in a reckless fashion with regard to crossings and joints, yet be untrammelled by any restriction. Bunching is permitted between wires of the same polarity on final sub-circuits. Are wires from branch switches to lamps to be classed for the purposes of this rule as if always at the potential they have when the switch is closed or when the switch is open?

Rule No. 65.—A feature of the new rules is the introduction of tough rubber compound protection as a substitute for conduit or casing. The tests which this class of protector has to undergo to conform with the regulations include capability to resist abrasion, acid, oils, and alkalis. The tests are hardly stated with scientific accuracy as to the degree or period of resistance to these formidable enemies of wiring systems. But everybody knows that "cab-tire" sheathing is meant when the Institution uses the more sonorous title, and the precise degree of resistance to trouble is the very high standard set by that doughty class of covering.

It is to be hoped that no hard-faced inspector will apply the fire test specified; under using conditions "The resistance of the covering to fire is to equal or be superior to that of vulcanised rubber." Generally the vulcanised cover of cables is tucked safely away in a steel conduit, and the inspector's blow-lamp is not so deadly as it would be if tried on the neatly varnished surface of a bunch of tough rubber compounded cables cleated to a wood partition, and possibly running up to a nice dry garret.

Rule No. 66 refers to armoured wiring, and states that the metal covering, brass, copper, or the like, must be of substantial thickness. One wonders if the Stannos covering would pass muster.

Lead-covered systems are dealt with under Rule No. 68, and they are dealt with in style. The rule does not permit of lead-covered conductors beneath floors, behind wall surfaces, or on new brick or plaster. Such severity shows a very high degree of freedom from mere commercial interests on the part of the Committee, for some of the largest cable companies have been pushing such systems for years, and recommending their use for all kinds of situations. The writer has seen a whole book full of pictures of handsome buildings wired throughout with lead coverings. Personally, he felt that it was a pity; but there were the names also attached of a host of contractors, and even of consultants, who had risked the experiment.

Lead-covered systems ought not to be too much encouraged, but they are better than some of the other systems that are permitted more freedom under the rules. If such conductors were further protected by a thorough coating of bituminous compound or tape, they would be saved for a long time from the chemical elements of destruction which lie in wait for lead behind building surfaces. Of course, some of the modern systems are covered with a substance which looks like lead, and is so largely, but is stated to be a "special metal." Does that exempt such systems from the control of Rule No. 68? In this connection one remembers that some years ago it was considered necessary to specify a high percentage of pure English lead for cable coverings. Now it seems that cable makers desire to get away from the very name of lead for indoor work.

Flexible conductors are next dealt with, and Rule 71 reminds us that fitting flexibles must only be joined to the ordinary wiring by screw terminals, and not by soldering. In the installations which have lasted for nearly a quarter of a century without trouble, we soldered such connections, and, in addition, soldered the flexible at the lampholder ends, and thus obviated the risks of sparky hot contacts in inaccessible places.

We now pass to the section dealing with "Protection in Special Positions." Here there is no hint of how to proceed in corrosive, high temperature, wet or other difficult places, but the section refers us back to four preceding rules, and goes on merely to specify the use of casings and tubes for partitions, &c.

Bare conductor conditions are then well described in Rule No. 75, with nine sub-divisions. There is, perhaps, one section too many, as the matter of double insulation with straining gear is the subject of sub-division (*b*), and again appears fully in (*e*).

Rules 87 to 95 are devoted to switch and distribution boards, and deal with the subject well. It should be noted that teak-cased fuseboards must now be lined with fire-resisting material, and a minimum clearance of 1½ in. must be provided. One hopes that the makers will act at once in this direction and save contractors the worry of making special big cases.

Switches and circuit-breakers are described in Nos. 96 and 97. The chief item of interest is the condemnation of that type of ironclad switch which has a slot for the handle. It has always been a wonder to the writer how such a futile type persisted. The sizes of switches are governed by load tests. This is quite proper, and one hopes that makers will now classify their switches accordingly, and not call a switch 50-amp. size when under prolonged working conditions it will only break and carry 10 amp. safely. Some indication of approved contact areas might with advantage have been appended to the rules.

The sections devoted to fuses and wall plugs and sockets have been considerably improved. It is evident that the Committee attach great importance to their recommendation to use cord-grips on portable appliances. It is repeated three times (Rule 104, 109, and 114). Does it apply to portable standards?

Rule No. 110 says that switch lampholders must be controlled by a wall switch. Lately there has been an extended use of ceiling rose switches. Are they to be classed as lampholder or as wall switches?

Rule 111 states that a lampholder must not be in metallic connection with the metalwork of a portable hand lamp. Must we fit insulated holders as well as cord-grips on all portable standards now? There is much to be said for the general adoption of insulated holders except on cord pendants, where they are not necessary.

There are several important provisions anent heaters in Rule No. 117. Those taking over 1,000 watts are to have D.P. switches. It is to be hoped that the ironmongers and stores—so beloved by the Tungsten Lamp Association—who are now selling 2, 3, and 4-KW. heaters, will tell their customers of this necessity. Those of us who are only electricians will note with malicious glee that the Institution anticipates heaters being used with pressures up to 650 volts. The smart ironmongery salesman may expect to hear something from madam then! Nothing is said about the earthing of heaters.

Manufacturers must note (Rule No. 118) that at least one section of the heating elements is to be controlled by the wall switch only.

Rule No. 120 states that heating circuits must be protected by a wall switch in each room. Thus in a dining-room with sockets for radiator, hotplate, &c., a big master-switch must be provided at much expense, and probably never used.

Resistances, choking coils, and transformers are next dealt with, then motors and dynamos. Nothing is said about the earthing of any of these,

neither is any suggestion given as to approved methods of wiring to them. This is a point on which much guidance is necessary.

In dealing with accumulators, Rule No. 126 states that "each regulating cell should be protected by a fuse." This is astonishing. If such fuses are to be of any use they should be placed near the junction with cells. The atmosphere of a cell room will soon cause the fuses to blow, and in blowing they may even cause the cell room to blow up. In any situation the blowing of a fuse on a regulating cable would cause serious flashing at the switch regulators on the board.

Again, Rule No. 127 implies that a battery must have a D.P. switch and fuse control. This is often difficult to arrange in practice, and protective control can be otherwise secured.

Some differences are made in the tests for wiring. It is not now necessary to test the wiring proper before the fittings are erected. The old method was useful when the work was divided; now in such a case, when the tests are low, there may be difference of opinion as to where the faults lie.

We know that branch switches and their treatment are the chief factors in an insulation test. Yet these are not counted, and the insulation must not be less in megohms than 25 divided by the number of lamps.

An appendix is given which shows the number and sizes of 250-volt cables which can be drawn into the various conduits made to the Engineering Standards Specification. The table differs here and there from that prepared by the various conduit makers for the same sizes of cables and conduits. No indication is given of length of conduit through which the stated number of wires can be drawn, nor of the reduction in yards of length per normal bend. Neither is note given of the sizes of conduit for single main conductors. If the table is worth giving at all it should be complete for convenient reference.

A table prepared for the 650-volt cable would have been even more interesting, for then we should be learning about cable thicknesses which have hitherto been beyond our experience.

A great amount of space is occupied throughout the pamphlet by general specifications of items like copper conductors, ceiling roses, and constructional details of switches, sockets, fuseboards, and other accessories. This in spite of the fact that some of these particulars are already published fully in the British Standard Specifications. Some advantage in clarity and easy reference would be gained if such manufacturers' items were printed separately in a section by themselves, and not interposed with matter referring to methods of use and erection.

In the few months which have elapsed since the rules were issued, several critics have directed attention to the more important alterations required in current practice, and it has been suggested that this issue should have been delayed until after the war, when the wiring world would be less harassed with urgent work and more ready to consider changes.

The rules are not yet final or perfect, however, and now that peace is distantly in sight, and stocks of old standard articles are unprecedentedly low, it is the best time to be preparing and changing patterns and methods. So the next set of regulations may be on more model and permanent lines and be a real charter to good average wiring practice.

Board of Trade Inquiries.—The Commercial Intelligence Branch of the Board of Trade has received applications from firms at home for the names of manufacturers or producers of:—Bulbs for electric lamps; electric smoothing irons for boot uppers; and steatite insulators.

THE BRITISH ASSOCIATION.—IV.

The Utilisation of Coal as Fuel.

During the visit of the British Association to Newcastle-on-Tyne a joint meeting of the Geology and Chemistry Sections was held, on September 7th, on the investigation of the chemical and geological characters of different varieties of coal with a view to their most effective utilisation as fuel and to the extraction of by-products.

Prof. G. A. Lebour, in opening the discussion, said that the attitude or relation of geologists and chemists to the matter of coal was rather a peculiar one. Geologists had to find the coal, but in order to ascertain that the mineral found was coal they had to turn to the chemists, and the chemists could not always tell. Some authoritative classification of coal should be arrived at which should be to the satisfaction of both the geologists and the chemists. Coals were very different, and their chemical properties were not uniform; there were known cases in which two coals had practically the same composition according to the analysts, but differed in their physical properties. It was the physical properties that were of interest to the industrial world, and therefore they would like, if possible, to have a definition of coal which might comprise all sorts of schedules, such as coking, &c., and its physical and chemical properties. Geologists regarded coal as a rock, usually found in layers, with a roof and a floor. Floor and roof both varied, and according to the variety and difference in the roof there should be a corresponding difference in the nature of the coal. Chemists had very often to investigate coal without the slightest knowledge as to the conditions under which it was secured. If those particulars were given to the chemists, they might be able to explain the phenomena that had presented great difficulties.

Prof. W. A. Bone said the great difficulty with the chemists was that there was not much to say of a definite character. They usually applied certain tests to coals to secure information regarding their specific use for commercial purposes, and used tests which had been found to be more or less satisfactory. They could determine the carbon, hydrogen, and organic nature with a certain amount of precision, but too frequently these results came out differently according to the amount of air. More recently they had been studying the action of pyridine, which removed and dissolved certain constituents in the coal, and a good deal of work had been done by other individuals with other methods of testing coal, but little had been done in the way of correlating, or bringing the different undertakings to a focus, so that they might be seen in their proper perspective. Until that was carried out he did not think the chemists would be in a position to say very much about the exact chemical nature of the constituents of coal.

Prof. Kendall, regarding the matter as a geologist, was of opinion that much research work was needed in co-operation with the chemists. There should be a general investigation of the coal and of coal seams, because a chemical analysis was not enough. The ash present in coal was one of the factors controlling its economic use, and so they would like to know what the ash was, and what was its relation to the original plant substance.

Dr. J. T. Dunn said they should know what each section was doing. Until chemists knew something about the chemical nature of coal they could not hope to present any scientific classification to the geologists, and they would not get far until they knew whence the coal came. Chemists, geologists, and botanists should join in their researches.

Prof. Bone thought there was every prospect that shortly the State would take up the question and grant subsidies for the investigation of coal. It was practically the result of the movement begun at the British Association meetings at Manchester last year and in various scientific quarters as to the value of the properties of coal. They had had an assurance given that the question would be dealt with in the very early future.

Prof. Bedson said his study of coal over many years impressed him with the fact that the difficulty involved in the problem was the question of the chemical nature of coal. Pyridine dissolved up to 30 per cent. of the coal, but of the composition of the remainder they were ignorant.

Dr. Marie C. Stopes spoke of the little progress that had been made in the study of the constituents of coal, and said that the chemists, in estimating the nature of coal unaltered by heat or chemical action, had done no more than to separate them into two main classes of constituents, which had been termed cellulosic and resinic. If the different by-products from coal were traceable to specific parts of plant life, and those plant remains were recognisable in the plant itself, a considerable step might be made in the knowledge of coal and its potentialities, for the individual plant portions might be isolated by suitable methods, and the substances for which they were responsible when coal was heated, determined. It was on such work that they were engaged. This study was obviously a case for co-operation. The ultimate aim of the research was a complete scientific knowledge of the chemical composition and mode of formation of coal.

Dr. D. P. Jones and Dr. G. Hickling also took part in the discussion.

The Problem of Industrial Unrest.

THE Economics and Statistics Section of the British Association on September 6th turned its attention to the question of industrial unrest, the basis of the discussion being the report of a committee on means for the promotion of industrial harmony.

The report, which was very long, considered the subject in three sections: The causes of industrial unrest, attempts at diminishing industrial unrest, and the Committee's recommendations. The causes were stated to be: (1) desire for a higher standard of living, (2) desire of the working people to exercise a greater control over their lives and to have some determining will as to the conditions of work, (3) the uncertainty of regular employment, (4) the monotony in employment, (5) suspicion and want of knowledge of economic conditions, (6) the complaint that some labour is irregular and less satisfactory, (7) the effects of war measures. Attempts at diminishing industrial unrest included conciliation and arbitration boards, arbitration (*a*) voluntary, (*b*) compulsory, profit-sharing and co-partnership, and co-operation. The summary of the report stated that the aim of the investigation was to discover certain general principles which must underlie a harmonious economic organisation. Before the problems of industrial unrest could be solved those principles must be applied to particular industries. With their special application the Committee did not deal, and the suggestions put forward included only broad principles possible of wide application. The recommendations might be divided into groups, as they concerned: The general attitude and outlook of employers and workmen; machinery for dealing with disputes; the organisation of industry; and post-war arrangements. The recommendations were thus summarised:—

1. (i) That there should be greater frankness between employers and workpeople, and that they should discuss industrial matters together or through duly accredited representatives.

(ii) That employers should consider the cost of labour, and not the wages earned by individual workmen.

(iii) That the fundamental facts and principles of industrial and economic life should be known by both.

2. (i) That employers and workpeople should improve their organisations with a view to determining jointly the conditions under which industries should be carried on.

(ii) That in each industry permanent boards or committees be set up to consider all matters of common interest.

(iii) That there be a joint national board to which local boards could refer unsettled disputes.

3. (i) That the necessity for co-operation between employers and employed be recognised by both.

(ii) That employers establish: (*a*) Associations of one trade in a given district, (*b*) national associations of one trade, (*c*) local federations of trades, (*d*) national federations of trades. (*b* and *d* being organised under a system of representation.)

That workpeople establish unions and federations corresponding to the above.

(iii) From the two national federations there be elected an industrial council.

(iv) That the State give recognition to approved associations, unions, and federations under carefully devised regulations, the State being the representative of the consumer and of the community.

4. (i) On demobilisation, that district boards of really practical men be established to consider and adjust difficulties, especially as to the replacement in industry of men who have joined the Forces.

(ii) As to agreements and regulations in abeyance for the period of the war. The industrial community will have an opportunity for considerable reconstruction. The new organisation suggested should take this in hand.

Archdeacon CUNNINGHAM expressed a feeling of disappointment at the report, the recommendations of which had no relation to many of the causes of industrial unrest. There was no suggestion in it as to getting a higher code of morals both on the part of Capital and Labour. He referred to the housing question, and said employers of labour should be responsible for the proper housing of their employés.

Prof. W. R. SCOTT referred to the suggestion that had been made of an industrial war after the present military war, and said its prevention, while not in the power of any individual, was, he thought, within the power of the nation. If they could only prevent industrial war they could not only pay the interest on the war loans, but provide a material sinking fund for the reduction of the debt. He advocated co-operation between interests, and for that object the most practical method he could see was that associations representing capital and labour should act in conjunction.

Sir HUGH BELL said he did not accept the report in its entirety, although he was a party to it. No very definite conclusions could be suggested, for the question was in an obvious state of flux. The war had brought home these questions in a much more urgent form. It was clear that as soon as the war had come to an end problems that might have found a solution gradually would become urgently in need of an immediate solution. It seemed desirable in the present circumstances to present not so much definite conclusions as indications of the directions in which improvements could be sought. It was impossible, as they understood matters at present, to devise any scheme of compulsory arbitration. What they wanted to bring home to Capital and Labour alike was the fact that the centre of gravity was very much changed. He was convinced that they must dismiss proposals of profit-sharing as a solution of the problem before them. That they were going to have a troublous time, he thought, was beyond doubt, but the disposition to wait until circumstances had developed, rather than make preparations for eventualities that might never happen, would, he thought, stand them in good stead, as it had before.

Address to the Economic Science and Statistics Section.

By PROF. A. W. KIRKALDY, M.A., PRESIDENT OF THE SECTION.

(*Abstract.*)

IN every sphere this great war has worked, and will yet work, great changes, but in the economic sphere the effects that can already be noted far exceed those in any other. Up to the present the war has cost us over £2,000,000,000. We have consumed that amount of commodities and services, we have diverted capital and labour into new channels of production, but these channels, unlike those connected with a good scheme of irrigation which may make the wilderness to blossom like the rose, have emptied themselves in the desert and the runnels are now dry and worthless. The warring Powers have turned their attention from profitable production, the output of wealth, the exchange or use of which will produce new wealth, to the production of instruments of destruction, which not only consume themselves, but carry out a work of destruction which entails the loss of other accumulations or possibilities of wealth. There is absolutely nothing tangible to show for this expenditure. Thus the position is that for two years we have been consuming our wealth, and to that extent must remain the poorer and be short of many of the goods and services we used to consider necessaries of life, until we have, by renewed efforts and a return to the industries of commerce and peace, taken measures to restore those useful things which have been consumed.

When the war ends, it will be incumbent on us all to redouble our activities, increase the productivity of the mill, factory, and field; for, so long as there is a deficiency in excess of what we were accustomed to, so long must some of us, and especially the poorer members of the community, feel the pinch occasioned by this devastating war.

The war, in spite of the suffering and loss occasioned, has not been all loss. As a nation—nay, as an Empire—we have found ourselves. We shall emerge from this war a better disciplined, a more serious people, better equipped mentally and physically to cope with new conditions. We have learned what hitherto had only been suspected, or at most known to a few, that we have not produced anything like our industrial maximum.

An insidious element of friction threatening to develop into class war has been sapping our energies. There have been faults on both sides, but daylight is being thrown over the situation, and the waste and loss of this friction has been laid bare. If we do not take to heart this great experience and alter our ways for the better, then we deserve to go down as a nation.

Not only was there loss through friction between employers and employed, but in many industries we were continuing to use out-of-date tools and methods long after they should have been discarded. A long era of prosperity had not, indeed, caused decadence, but was threatening to do so. The war has shaken us up and shown us the realities of life, making the mistakes of the material side with which we have to do here plain and unmistakeable.

To beat the national enemy we had to re-equip our workshops, and the new equipment will be available to a great extent for future work. Moreover, we have been taught by a bitter lesson that up-to-date equipment is as necessary if we are to maintain our position as an industrial and commercial nation as it was to enable us to maintain our international position.

I want to attempt now to make a forecast of what may be expected in the commercial and industrial spheres when we sheathe the sword. Germany has over-run some important manufacturing districts. Belgium, North-Western France, and Poland have not only been occupied by the enemy, but machinery and industrial equipment have in many cases been removed to Germany. The busy industrial areas mentioned have undoubtedly suffered very considerably, and will require to reconstruct and re-equip towns and factories, and

to reorganise the labour force. To set commerce and industry at work again on anything like the previous scale must be a work of some time. On the other hand, in spite of every effort, Germany has found it impossible to interfere with the industries of the United Kingdom either by force or intrigue; nor have the Entente Powers as yet invaded Germany. Indeed, for the purpose of this forecast it is wise to assume that German industrial equipment will not be affected detrimentally by the war. When once again the world begins to get into its normal stride, so far as one can foresee, England and Germany will for some time be the only two European nations prepared to take any considerable part in international trade.

Meantime, during the period of the war, two countries—the United States of America and Japan—have enjoyed new and unlooked-for trading advantages. So far as competition from the United States is concerned, it is probable that we need not feel unnecessarily pessimistic. The South American States are at the beginning of a period of development which may well prove to be rapid. The possibilities opened up by the Panama Canal route, even though the present canal should prove a failure, will not be resigned before another attempt is made to pierce the isthmus; that a cutting will eventually be made is, in my opinion, beyond question. American developments, then, may be expected to take place principally on the American continent, in the Pacific, and in the Far East. In these regions there is ample room for both British and American enterprise.

Nor will Japan, for some time to come at any rate, compete with our staple manufactures. The development made by Japan during the war would seem to indicate that it is Germany, and not Great Britain, that will have to bear the brunt of Japanese competition. Small goods and fancy articles which came freely into our markets from Germany and Austria before the war are now being made in Japan. Our merchants, being unable to get supplies of these goods, sent samples to Japan, with the most satisfactory results as to price, finish, and quality. Thus we have been able to extend our business relations with our ally at the expense of our enemy. Moreover, although there is no certain information on the subject, it is more than possible that when normal trading is resumed it will be found that Japan has been extending her business in these and other classes of goods into other markets hitherto the preserve of the Central Powers.

Hence it is of special interest to attempt to forecast to what extent and with what prospects England and Germany will be in competition in international trade after the war. This will depend for the most part on two sets of factors: (1) the internal industrial condition of each country, and (2) commercial factors. So far as the former are concerned, there is much that this country should realise and take to heart.

The United Kingdom, in spite of the war and its heavy drain on our resources, has been enjoying an exceptional time of seeming prosperity. A large section of the workpeople have been earning high wages, whilst some employers have been earning handsome profits. High prices, high wages, high profits have been the order of the day. The return of peace will very considerably modify the last two of these, and how will those affected face the change?

To understand how the parties will answer this question, certain agreements must be remembered. Foremost among these is the State guarantee that certain trade union restrictions and Government regulations which have been in abeyance for the period of the war shall be reimposed when peace is restored. If we were reverting to pre-war conditions there would be much to be said for this, but one hopes that both parties realise fully that conditions have radically changed, and that in consequence both employers and workpeople must be prepared to meet the new situation in a new spirit. Why were these agreements and regulations set aside? Because it was known that they hampered output, and our military success depended upon our producing the greatest possible amount of munitions of war. Our commercial success will now equally depend on getting the utmost possible production out of our industrial equipment. Are we, then, going to restore these obstacles just at the most critical moment?

With the return to more normal times the national necessity for war stores and munitions will cease, and our industrial forces will have to rely on the home and foreign markets for employment. Foreign competition will almost certainly be greatly intensified. There may be at first a great demand for manufactured goods of all kinds, as a consequence of decreased supplies during the war, but all the principal trading nations will strain every nerve to get the greatest possible share of orders. If, under such circumstances, we indulge in an internal struggle between Capital and Labour, instead of bending our whole energies to retain and extend our hold on markets, we shall lose an opportunity which is not likely to return. And yet there is a widespread expectation among employers and workpeople that the European war will be succeeded by serious industrial strife.

So far as the commercial factors are concerned, we have almost everything in our favour. We have not outraged the sentiments of humanity by employing inhuman methods in waging war. We have retained our position as the headquarters of the money market. We have our shipping resources and equipment practically intact. Our merchants and exporters are keen and ready to carry on their business with even greater energy than before the war. We have arrears to make up, but have the will, and, with harmony at home, the ability to carry on a more extended trade. Our capital has not been seriously affected, and there are no signs that it will be—our financial establishments and banks are prepared to do their share.

Turning to Germany, there is a most interesting condition of affairs to study. If beaten in the war Germany will be a poor country; the economic position will be deplorable, but hardly irreparable. Every section of the community has already felt to some degree the effects of the war. When peace comes there will be a determined attempt to regain the old position. A disciplined people, acting under a Government that will be compelled by circumstances to foster every possible means for repairing the broken machine of trade and for restoring the national wealth, will without any doubt be prepared to make heavy sacrifices to regain what has been lost. The Government will offer advantages in the shape of low railway rates and canal facilities, and, as far as possible, bounties on export business and on shipping to encourage and extend foreign trade. Manufacturers and merchants will cut down profits, and workpeople will be carefully taught that only by increased productivity and by a period of low wages can that which has been lost be regained. One foresees a remarkable attempt by a united and determined nation to make good in as short a period as possible the waste and loss occasioned by the war and the blockade. German goods for export will be cheap, and the low price will be still further emphasised by the depreciation of the mark. For so long as the mark is at a discount there will be a *pro tanto* advantage to export trade, and although the mark may eventually regain its par value, a few months or even weeks will have an appreciable influence on re-opening foreign business.

Thus a comparison of English and German possibilities in foreign trade on the resumption of peace shows that there are certain advantages on both sides. The German advantages are solid and appreciable, but if England is seething with industrial friction the advantages she possesses will be neutralised and her failure a certainty.

This leads us to consider whether a policy can be devised which will remove causes of friction and assure to our industries a new era of prosperity.

As the war developed there has been a growing tendency to demand organisation in every sphere of national life. The striking successes scored by Germany have been universally, and probably rightly, ascribed to thoroughness of organisation and complete preparedness before provoking the conflict. It has been forgotten that Germany has for many decades prided herself on her Army, even as England has relied on her Navy. The test of war has proved that Germany was a very difficult country to oppose by land, but that in naval matters England is supreme. The economist, however, has to investigate into those matters which are connected with his science—namely, the production, the distribution, and the consumption of wealth. Can it be said that the want of organisation and other faults of our military system are typical of what has been going on in the industrial and commercial sphere? I, for one, cannot bring myself to accept the truth of this. For upwards of a century our industries have been gradually developing, and the progress has, on the whole, been along healthy lines—each decade has seen some advance more or less great.

German attention to industry and commerce is much more recent. She was able to benefit by our experience, nor was she slow in doing so. To take a simple illustration: A manufacturing firm of 50 years' standing has developed a system and has equipped factory and workshop as occasion demanded. A rival, seeing the possibility of competing successfully in the same business, organises a new company, raises the necessary capital, and is able to commence operations with plant, machinery, and equipment of all kinds absolutely up-to-date, and even with some new improvements. In these circumstances, provided that the management be good, and that there is a demand for the goods produced, the new firm has on the manufacturing side considerable advantages. The older firm, however, is not devoid of advantages. It has a certain connection, a goodwill, and with able management these will enable it to compete with the newcomer, whilst the managers will have time to consider how to put the manufacturing side of their business on a par with that of the rival firm. The position in a simple instance like this is fairly easy to understand. In the case of a nation, with its many and varied interests, it takes a very much longer time for the situation to develop. The agitation for Tariff Reform and Colonial Preferences is a proof that several years before the war broke out some Englishmen were awake to the fact that a new condition had come into existence, and that, if we were to preserve our advantageous position, we must take careful stock of newly-arisen factors in world-trade. For Germany was not the only one, nor perhaps the most serious, of these factors. The United States of America, from the time of the Civil War, had bent her energies to the work of internal development. Having concentrated on this for nearly 40 years, she began to expand a world-policy both political and commercial. Japan, too, emerged with unexpected suddenness into the arena. Thus, as the nineteenth century drew to a close, the economic interests of England required careful and earnest attention. The fiscal controversy undoubtedly had the great and important effect of waking English traders out of the lotus-eating condition into which they were in

danger of sinking. All our principal, and many of our less important, industries were carefully reviewed. There was, however, a very subtle policy being pursued, which required very minute knowledge and wide experience to grasp. It was our proud boast that we left trade free and untrammelled, that we believed in the health-giving effects of open competition. It needed the stern lesson of the war to make known how this generous policy could be utilised to our detriment by a rival commercial nation. The facts as to the exploiting of the mineral resources of the Empire, as to how the dye and colour industry and various by-product industries have been developed so that certain vital trades almost passed under foreign control, came to light only just in time.

It became plain, as these facts leaked out, that we needed a better system of industrial and commercial intelligence. There was also a lack of unity of working among our principal industries incompatible with the growing interdependence which has been a marked feature of modern economic life. Sufficient of the facts have been made public to warrant the demand for reconstruction and improved organisation of those departments responsible for the national trade.

It would be most unwise, as well as ungenerous, to attempt to blame our Board of Trade. That department has, on the whole, worked hard and well for British interests. But it is both wise and necessary to criticise the policy that has overweighted this one Government department, and although there should be very careful consideration before either recommending or making a drastic change, attention ought to be given to the frequently-expressed opinions both of chambers of commerce and of individual traders in favour of the creation of a Ministry of Commerce. To this Ministry there might be transferred some of the functions of the Board of Trade, whilst at the same time the new Ministry might be responsible for maintaining that general survey over trade and commerce without which any organisation we may attempt would be incomplete.

If this view be accepted, it is not fair to charge our industrial interests with lack of organisation. An examination of any one of our industries—shipbuilding, shipping, the manufacture of various goods for export—shows that each has been well, and in many cases exceptionally well, organised; but the organisation requires to be completed by some machinery with responsible officials to co-ordinate the organisation of the several interests. Even in this direction something has been attempted. The Associated Chambers of Commerce gives, at any rate, the germ of an organisation for attending to this great need. We may ask whether this could be still further elaborated so as to give the country what is wanted. Have our chambers of commerce sufficient standing to make their association strong enough for the work, or should we look to the State to supply the keystone to the arch? Perhaps the time has come when a word of warning should be uttered. Are we not getting rather too prone to fall back upon the State? We were, and perhaps still are, the most self-dependent people in existence. Both the employer and the trade union have in the past been but little inclined to turn to the State. Can the completion of our industrial and commercial organisation be adequately attained by the interests concerned, or must we look to another State department or sub-department to effect what is required? Our past history seems to suggest that before turning to the State we try the initiative of the interests at stake.

(To be concluded.)

Radio-Telegraphic Investigations.

The report of the Committee states that the observational work done for the Committee during the past year has been carried out at about 25 stations distributed in Australia, the United States of America, Canada, New Zealand, Ceylon, Trinidad, Dutch East Indies, Fiji, and the Gold Coast.

Of the four kinds of forms issued by the Committee for the collection of statistics, the first, relating to the number and strength of the strays at 11 a.m. and 11 p.m. Greenwich mean time, has been in most regular use, and the stock is almost exhausted. No further edition of this form will be issued during the war, and thus the collection of statistics will come gradually to an end.

The difficulty of obtaining clerical assistance for the work of reducing the forms has greatly impeded progress, but a certain amount of work has been accomplished and has yielded results of interest. So soon as the several sections of the work are rounded off the results will be published.

The reduction of Form I is proceeding by the collation of records and reports of excessive atmospheric disturbance since August, 1914, in North America and Australia, and by their examination in conjunction with meteorological data from the corresponding daily weather charts.

The reduction of Form II is proceeding by the correlation of instances of exceptionally good or bad transmission with meteorological data, and by analysis of statistics from Cocos, Fiji, Lagos, Malta, and Sierra Leone.

Several important exceptional phenomena have been reported which will, after discussion, be published. These include reports of aurora, strays, and signals in Alaska and Hudson Bay; severe atmospheric disturbances in Malta; simultaneous strays on both sides of the Atlantic; effect of tropical storm in the Gulf of Mexico, September 30th, 1915.

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

12,808. "Dual ignition system for internal-combustion engines." T. Burgess. September 11th.

12,824. "Electrical measuring instruments." British Westinghouse Electric & Manufacturing Co. September 11th. (U.S.A., September 10th, 1915.)

12,842. "Incandescent electric lamps." J. T. Corneille. September 11th.

12,850. "Portable electric lamps for inspecting purposes." R. W. H. Dyer. September 11th.

12,874. "Automatic and electrically-controlled sprinkler for fire, &c." R. J. Wilkinson. September 12th.

12,897. "Manufacture of articles embodying components of vulcanisable plastic and fibre." A. E. Alexander (Rubber Regenerating Co.). September 12th.

12,903. "Bipolar electrode electrolysers." G. G. Hepburn. September 12th.

12,950. "Manufacture of electrically-welded and hand-made link chains and cables." R. Green. September 13th.

12,971. "Automatic and semi-automatic telephone systems." H. J. Herink and The Relay Automatic Telephone Co. September 13th.

12,985. "Art of electrical tuning." M. I. Pupin. September 13th. (U.S.A., September 17th, 1915.)

12,986. "Electrical wave transmission." E. H. Armstrong & M. I. Pupin. September 13th. (U.S.A., September 17th, 1915.)

12,987. "Wireless systems, &c." E. H. Armstrong & M. I. Pupin. September 13th. (U.S.A., October 1st, 1915.)

12,988. "Transmission of electrical signals." E. H. Armstrong & M. I. Pupin. September 13th. (U.S.A., February 10th.)

12,989. "Sparking plugs." D. A. B. Hill. September 13th.

12,994. "Distant control of electric circuits for operating motors, &c." L. G. W. Guest & H. O. Merriman. September 13th.

12,997. "Sparking plugs." V. Perrett. September 13th.

12,999. "Telephone appliance." W. C. Croxon & F. Maver. September 13th.

13,005. "Magnetos for telephonic, &c., calls." J. B. Naberes. September 13th. (France, September 18th, 1915.)

13,080. "Telegraphy." J. S. Withers (Cox). September 14th.

13,089. "Selenium cells." E. E. Fournier d'Albe. September 15th.

13,097. "Sparking plugs for internal-combustion engines." T. Crosbee and Sons and H. R. Wilks. September 15th.

13,121. "Charging systems for storage batteries." British Thomson Houston Co. (General Electric Co., U.S.A.). September 15th.

13,142. "Electric battery cells." C. K. Bamber. September 15th.

13,150. "Electric cable terminals." W. T. Henley's Telegraph Works Co., Ltd., & W. H. Nichols. September 15th.

13,173. "Magneto ignition apparatus." G. F. Cooke. September 16th.

13,181. "Selenium relay." M. Martinez. September 16th.

13,007. "Telephone hand set." B. B. Grace, G. H. Nash & Western Electric Co. September 13th.

13,071. "Devices for closing contacts by radio-telegraphy." T. H. Nakken. September 14th. (Holland, September 15th, 1915.)

PUBLISHED SPECIFICATIONS.

1915.

7,757. Electrical Systems for use with Internal-combustion Engines. C. F. Kettering & W. C. Chryst. May 25th. (June 24th, 1914.)

8,012. Telegraph Transmitters. H. J. C. Forrester (Piersen Telegraph Transmitter Co.). May 31st.

12,309. Step-by-step Rheostat Switches. F. A. Roes. August 26th.

12,318. Electrical Heating and Cooking Apparatus. C. G. Nobbs & W. W. Nobbs. August 26th

12,444. Systems of Electric Ship Propulsion. British Thomson-Houston Co. (General Electric Co., U.S.A.). August 30th.

12,561. Telegraph Systems. British Insulated & Helsby Cables, Ltd., and H. H. Harrison. September 1st.

12,564. Wireless Signalling Systems. British Thomson-Houston Co. (General Electric Co., U.S.A.). September 1st.

12,673. Automatic Telephone Systems. Relay Automatic Telephone Co., Ltd. September 3rd. (November 17th, 1914.)

13,062. Fittings for Electric Lamps. S. Quincey. September 13th.

15,303. Systems of Distribution for Electrically-operated Railway Trains. P. S. Turner. October 29th.

17,034. Means for Laying and Collecting Field Telephone Wires. A. C. G. Smith. December 3rd.

1916.

The numbers in brackets are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1,309. Means for Supporting and Insulating Electric Lines. Bullers, Ltd., & G. V. Twiss. January 27th, 1916. [101,233.]

1,635. Electric Joint. G. H. Scholes. February 3rd, 1916. (Addition to 9,964/15.) [101,237.]

3,559. Electric Car-lighting Equipments. Albion Motor Car Co. & T. B. Murray. March 10th, 1916. [101,243.]

4,575. Holders for Incandescent Electric Lamps. J. Salt. March 28th, 1916. [101,250.]

6,629. Means for Telephonic Communication to and from Moving Railway Trains and the like. V. G. Werner & K. H. Warfvinge. May 11th, 1915 [100,453.]

9,193. Telegraph Transmitting Apparatus. W. J. Mellersh-Jackson (Western Union Telegraph Co.). November 4th, 1915. (Divided application on 15,579/15.) [101,278.]

11,397. Means for Telephonic Communication to and from Moving Railway Trains and the like. V. G. Werner & K. H. Warfvinge. August 21st, 1915. [101,281.]